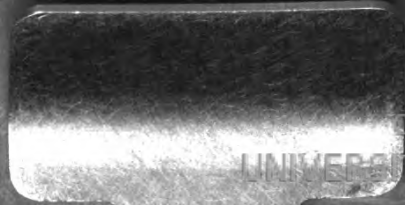


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HOSPITAL CORPSMAN 1

NAVY TRAINING COURSES

NAVPERS 10667

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HOSPITAL CORPSMAN 1

A course in nine chapters with test material and instruction tests, prepared by the U. S. Naval Hospital Corps School, Naval Hospital, Portsmouth, Virginia, under the supervision of the Training Branch of the Bureau of Medicine and Surgery, with the assistance of the Bureau of Naval Personnel

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PREFACE

This training course consists of material divided generally into three parts for the purposes for which it is intended. First, it contains extractions from a number of publications to provide an overall coverage of the subject to be studied in order to prepare for advancement in rating. Second, it contains a series of instruction tests which immediately follow the text. These tests are to be completed by the student after he has studied the material. These tests and the answers provided in appendix I, should be very helpful in preparation for examination for advancement to the next higher rating, since the questions embrace a large part of the material in which knowledge and proficiency are to be demonstrated.

The contents of this course conform to the requirements for advancement to Hospital Corpsman First Class as set forth in the *Manual of Qualifications for Advancement in Rating*, NavPers 18068 (Revised) and are based upon material contained in the following references:

- (a) *Handbook of the Hospital Corps, U. S. Navy, 1953.*
- (b) *Manual of Naval Hygiene and Sanitation, Volume I, NavMed P-126.*
- (c) *Manual of the Medical Department, U. S. Navy.*
- (d) *Bureau of Ships Manual.*
- (e) *Bureau of Naval Personnel Manual.*
- (f) *BuMed Instructions.*
- (g) *Navy Comptroller Manual, Volume II.*
- (h) *Bureau of Supplies and Accounts Manual, Volumes II, III and V.*

Completion of this course is a prerequisite for advancement to Hospital Corpsman First Class except as otherwise provided by current BuPers instructions. A Hospital Corpsman Second Class is not eligible to take the examination for advancement until an entry is made in his service record that a training course has been completed.

HOW TO USE THIS COURSE

The questions which appear in the Assignments are based on various chapters of the text, as applicable. The answers are to be found at the back of the book. Obviously, the *easy* way to work the Assignments would be to refer immediately to the answers, but the student who does this will not obtain much benefit from the course. The primary purpose of completing this course is to prepare the student to succeed when he is examined for advancement. As the examination questions for advancement in rating will contain questions from the text which may not be covered in these Assignments, the student who studies the text material thoroughly will find himself better qualified to pass the examination. If available, the references should be used with this course.

The student is *not* to fill in the answers in this book. A separate sheet of blank paper is to be used to fill in the answers to each Assignment. The text material should be read and understood thoroughly before attempting to answer the questions. Reference to the answers in the back of the book should not be made until the subject has been carefully studied and the answers to the complete Assignment written down. After checking, the student should go on to the next Assignment.

The questions contained in the various Assignments of the instruction tests are of three types. The number of questions will vary in each Assignment in accordance to the quantity and significance of the subject matter. An example of each type question is given and explained below.

COMPLETION ITEMS

In this type question a blank space is provided so that the proper word or words can be written in to complete the sentence or phrase.

Example

Complete the following statement by supplying the proper word or words.

1. The bone of the arm is called the humerus.

The term "humerus" is written in the blank space.

MULTIPLE CHOICE ITEMS

In this type, a question or statement is followed by four or more choices as answers, only *one* of which is correct.

Example

In the following statements or questions place the number preceding the correct answer in the space provided.

2. The unit of structure of animals and vegetables is the

1. atom
2. molecule
3. cell
4. gland

.....3.....

The right answer being "cell," the number 3 is placed in the blank space.

MATCHING ITEMS

This type question consists of two groups of related words, phrases, or symbols which are to be matched.

Example

To the right of each phrase or symbol in list *B* write the number of the most closely related item in list *A*.

3. Match the following anatomical positions.

A	B	
1. higher, above	anterior	2
2. in front	posterior	5
3. lower, below	superior	1
4. to the side	inferior	3
5. to the back		

The number preceding the correct matching terms in list *A* are placed in the blank spaces to the right of the items in list *B*.

When the answers to an Assignment have been written on the sheet of paper, they should be checked with the text matter and then rechecked with the answers in back of the book. All mistakes should be corrected at this time so that all the answers are right; then proceed to the next Assignment.

MEMORANDUM FOR THE TRAINING OFFICERS

This training course for Hospital Corpsman First Class contains or refers to material from diverse sources, and a series of instruction tests covering each chapter of the material presented.

These questions are presented in a form prescribed by the Bureau of Naval Personnel in the publication, *Constructing and Using Achievement Tests*, NavPers 16808-A, and conform to the requirements for advancement to Hospital Corpsman First Class as set forth in the *Manual of Qualifications for Advancement in Rating*, NavPers 18068 (Revised).

To provide a comprehensive coverage of the contents of this course, the student taking this course should:

1. Read the text material thoroughly.
2. Fill in the answers to each question in the Assignment.
3. Review the text material and try to correct all mistakes.
4. Refer to the answers at the back of the book for final checking.

In this manner it is expected that the student will review the text matter at least twice and should thus obtain a more definite concept of the subject.

A description of the types of questions used, together with instructions, appears under the heading "How to Use This Course" in the preceding pages.

The student shall be instructed *not* to fill in the answers in this book. A blank sheet of paper is to be used for this purpose with proper headings designating the subject, the Assignment number, and the answers written thereon. This measure should preserve the books in good condition for future use by other students.

Upon completion of this course, the Training Officer should proceed with the preparation of a test covering all the Assignments on this course. The student's grade for successful completion of this course can be determined by his performance in the test and should be recorded in his service record.

In the event that a student is to be transferred to another activity before completing the training course, certification

showing the number of Assignments completed should be made by the Commanding Officer and forwarded to the next duty station. A sample copy of the letter form with the required information is provided below:

ACTIVITY	
	Date_____
From: Commanding Officer.	
To:	Commanding Officer, _____ (Activity)
Subj: Certification of Progress in the Navy Training Course for Hospital Corpsmen (Group X ratings).	
1. This is to certify that <u>John Charles DOE, 732 01 60,</u> <u>HM2 USN</u> , has completed work on the Navy Training Course for HOSPITAL CORPSMAN FIRST CLASS as indicated below:	
a. All instruction tests have been successfully completed up to and including Assignment number _____	
	_____ Signature

LIST OF TRAINING PUBLICATIONS

NAVY TRAINING COURSES

Hospitalman, NavPers 10664
Hospital Corpsman 3, NavPers 10665
Hospital Corpsman 2, NavPers 10666

OTHER PUBLICATIONS

Handbook of the Hospital Corps, U. S. Navy, BuMed, 1953
Manual of the Medical Department, U. S. Navy, BuMed, 1952
Bureau of Naval Personnel Manual, NavPers 15791
Navy Correspondence Manual, NavExos P-388
Navy Filing Manual, NavExos P-20
Radiological Safety Regulations, NavMed P-1325
Manual of Naval Hygiene and Sanitation, Vol. 1, NavMed P-126
Bureau of Supplies and Accounts Manual (Vol. II—Chapter 3; Vol. III—Chapter 3; Vol. IV)

FOR MILITARY REQUIREMENTS

General Training Course for Petty Officers, NavPers 10055
Extracts from Uniform Code of Military Justice, NavPers 10873
Manual for Navy Instructors, NavPers 16103-B
Survival in the Water, NavPers 10080
Chemical and Biological Warfare Defense, NavPers 10098
Atomic Warfare Defense, NavPers 10097
U. S. Naval Security Manual, OpNav Inst. 5510.1A
Personal Affairs of Naval Personnel, NavPers 15014
U. S. Navy Regulations
Landing Party Manual (Chapters 1, 3)

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HOSPITAL CORPSMAN 1

CHAPTER

1

METHODS OF INSPECTION AND STORAGE OF FOOD

FOOD INSPECTION

1. The Medical Department is responsible for the inspection of all foods which are used in the Navy. This is especially important to individuals on independent duty on small craft in the tropics. It must be remembered that in the tropics, night soil, or human excreta, is frequently used as fertilizer. This is an excellent method for the transmission of certain diseases, especially dysentery. In these tropical countries, vegetables which are not to be cooked well, should not be permitted on board. Any fruits which do not require peeling should not be used. Even these should be inspected closely for breaks in the skin, and should be placed in disinfecting solutions before use. It is especially important to impress these factors on the members of the crew, to prevent them from consuming fruits and some types of vegetables while ashore. The hospital corpsman is referred to the *Manual of Naval Hygiene* for full discussion of these factors.

Meats used for food purposes generally come from the flesh of beef, swine, lamb, fish, and fowl, and flesh may be defined as any edible part of the striated muscle of an animal.

All meats received at consumer activities have been inspected by an inspector of the Meat Inspection Division, Department of Agriculture. All meats accepted in the naval service must bear this stamp.

Meat prepared for market may be fresh, prepared, or meat by-products. Fresh meat is meat that has been cut into wholesale or retail cuts and chilled or frozen.

2. *Beef* is derived from the carcasses of:

Steers.—Adult males of bovine species, castrated when young.

Heifers.—Young females of bovine species not fully matured, which have never borne young.

Cows.—Mature females of bovine species, which have usually borne young.

Bulls.—Mature males of bovine species.

Stags.—Males of bovine species castrated after reaching maturity.

Beef is graded on a composite evaluation of three general grade factors: Conformation, finish, and quality.

Conformation.—Pertains to the form, build or shape of the carcass. Breeding is a chief factor influencing conformation, and the best conformation is found in beef breeds. As carcasses decrease in conformation, the grade lowers. Quality of beef is applied to lean meat, fat, and bone. The quality of lean meat is indicated in its color and texture. Better quality beef has fat streaks interspersed with the lean meat, known as “marbling,” and the color is bright. Darker colored meat is indicative of age or of lower quality, and coarseness of texture and toughness is associated with dark colored meat.

Quality of fat is indicated by the texture without regard to color. Fat may be abundant and of a firm, brittle and somewhat waxy nature for external fat, or slightly waxy or rough as applied to internal fat.

Quality of bone refers to color, texture and to some extent, size. The younger the animal, the softer the bone; the red color is more pronounced and the spines of the vertebrae are tipped with white cartilage. As the animal matures the bones turn whiter and harder, and the cartilages gradually ossify. Finish refers to the quantity of fat on the carcass and the distribution of fat. On external surfaces of beef animals, fat becomes more evident as the animals near maturity. Young animals have relatively little fat distribution, while the older animals of high quality have carcasses well covered with fat. Lower grades of carcasses

show proportionately less distribution of fat, including marbling.

There are seven grades for beef from steers and heifers, and six grades for beef from cows, bulls, and stags. These are Prime, Choice, Good, Commercial, Utility, Cutter, and Canner. Cow, bull, or stag is not eligible for Prime grade. Only beef produced from steers and heifers will qualify for Prime grade.

Inspection of beef to determine the different classes and grades, requires long experience and a thorough knowledge in this field. In the United States, no meat should be accepted that does not bear the U. S. Agriculture Department stamp.

(a) The wholesomeness of the meat is dependent upon conditions of storage and transit, since considerable time may elapse between the date of the foregoing inspections and date of delivery to the consuming activity. The inspection of meat for quality (condition) by the medical officer at time of delivery should, therefore, be made with the view of determining desirability of the produce as food.

(b) Meat carcasses and cuts may be delivered "fresh chilled" or "frozen." Fresh, chilled products include those fresh meat items which have been held at temperatures just above freezing. They are chilled but are not, and have not been, frozen. The lean of frozen meat is usually considerably darker in color than fresh chilled meat of the same grade.

(c) Carcasses and cuts of meat are assigned to classes and grades indicating their probable palatability (flavor and tenderness). Classes refer to the size and age of the carcass. Grades refer to the shape or "build" of the carcass or cut (known as *conformation*), the amount and distribution of fat (known as *finish*) and the color, texture, and firmness of the lean and the character of the fat and bone (known as *quality*).

(d) Fresh chilled meat that is not discolored, that is firm and elastic to the touch, reasonably dry, and free from slime or slimy deposits and abnormal odors may generally be considered to be sound and wholesome. Undesirable characteristics to look for when inspecting fresh chilled meat

are: (1) Extensively moist, sticky or slimy surface; (2) Extreme discoloration; (3) Abnormal odors; and (4) Presence of edema or emphysema. Skewers thrust into the depths of cuts near joints or bone should have no unpleasant odor when withdrawn.

(e) Inspection of frozen meat items should be made with a view to determining whether or not conditions of storage and transit have been such as to maintain these items in frozen condition at all times. Alternate freezing and thawing of frozen meat items is objectionable and reduces the storage life of the meat.

(f) When inspecting cured and smoked meats—hams and bacon particularly, it should be recognized that rather extensive surface mold can be present without rendering the product unfit for food. In most cases where this condition has been allowed to develop on hams and bacon the product can generally be “overhauled” in such a way that it is made wholesome and fit for preparation as food.

3. *Veal* carcasses are well nourished and carry considerable fat. The flesh is light colored and fine grained. Calf carcasses are usually heavier in weight, not so well nourished and deficient in fat covering. Veal is the flesh of very young bovine animals, usually not over 12 weeks old. The largest percentage of veal comes from animals 3 to 6 weeks old. Calf carcasses are usually coarser in texture and the flesh is a deeper red color.

4. *Pork* is the meat of swine. It is paler in color than veal, has considerable fat. Pork cuts come from the carcasses of barrows, gilts, and sows. Only pork from barrows and gilts is used in the Navy. Because of sexual characteristics the meat of stag and boar carcasses usually does not enter into commerce at all. The flesh from these animals has a strong urinous odor when being cooked. Carcasses of good quality should be in good condition, sweet, sound, and free from bruises and discoloration. Oily and soft cuts, those with dark flesh, or with thick rind and coarse muscle fiber should not be accepted.

(a) Prevention of trichinosis:

(1) The prevention of trichinosis requires that pork

shall be effectively heated or refrigerated to destroy live trichinae. Destruction by heating is accomplished at a temperature of not lower than 137° F. It is important that each piece of sausage, ham or other pork product be heated throughout to or above the required temperature. Temperatures that destroy trichinae by refrigeration are variable depending upon thickness of the meat and exposure periods.

(2) The following directions for refrigerating are quoted from *War Food Administration Meat Inspection Regulations of March 24, 1945*.

“At any stage of preparation and after preparatory chilling to a temperature of not above 40° F. or preparatory freezing, all parts of the muscle tissue of pork or product containing such tissue shall be subject continuously to a temperature not higher than one of those specified in table 1, the duration of such refrigeration at the specified temperature being dependent on the thickness of the meat or inside dimensions of the containers.”

TABLE 1.—Required Period of Freezing at Temperatures Indicated

Temperature °F.	Group 1	Group 2
	<i>Days</i>	<i>Days</i>
5.....	20	30
— 10.....	10	20
— 20.....	6	12

Group 1 comprises products in separate pieces not exceeding 6 inches in thickness or arranged on separate racks with the layers not exceeding 6 inches in depth, or stored in crates or open boxes not exceeding 6 inches in depth, or stored as solidly frozen blocks not exceeding 6 inches in thickness.

Group 2 comprises products in pieces, layers or within open containers the thickness of which exceeds 6 inches but not 27 inches, and products in closed containers including tierces, barrels, kegs, and cartons having a thickness not exceeding 27 inches.

The product undergoing such refrigeration or the

containers thereof shall be so spaced while in the freezer as will insure a free circulation of air between the pieces of meat layers, blocks, boxes, barrels, and tierces in order that the temperature of the meat throughout will be promptly reduced to not higher than 5° F., -10° F., or -20° F. as the case may be.¹¹

5. *Lamb* is a general term which refers to the flesh of young animals of the ovine species of both sexes up to about 12 months of age. Mutton carcasses are from animals of the ovine species which have passed the lamb stage. Lamb carcasses are distinguished from mutton by their smaller and softer bones, lighter colored flesh, softer and whiter internal and external fats, smaller size of carcasses and cuts, and by the "break joint" in the front legs. Lamb foreleg joints break into four well defined ridges, which are smooth, moist, and red with blood. In older animals the break joint is less well defined, and the ridges more porous due to the hardening of the bones. The break joint is totally absent in mature mutton.

6. *Fish* is purchased in fresh, frozen, and canned form. Of the many varieties of fishery products other than fish itself, fresh and canned oysters and shrimp are the chief items procured.

Conditions in fish are generally determined by the degree of freshness: fresh, stale, or putrid. Putrid fish are unsafe for eating. Putrid fish and those showing advanced stages of staleness should be rejected.

Fresh fish have a bright appearance, the scales are firmly adherent and glittering, and the eyes are outstanding and full. The gills have a bright color and no odor, and gill covers and mouth are closed. The abdominal walls are firm and elastic, with no evidence of bloating and no discoloration. The flesh is firm and elastic and tight on the bones. There is a fresh, characteristic smell. When laid across the hand a fresh fish will not bend and it sinks in water.

Stale fish have a duller appearance. The scales are more easily removed, and the surface of the body may be slightly slimy or smeary, or abnormally dry. The eyes are red-

bordered and the cornea cloudy. The gills are pale yellow, dirty or grayish red, and covered with slime of a disagreeable odor. The body feels bony and bends easily, especially at the tail end. Finger impressions are easily made in the flesh and remain. The flesh is soft and easily removed from the bone. The fish floats in water.

Putrid fish have lost all brightness and luster. The color is dull and lifeless. The scales are loose and covered with a slime of offensive odor. The eyes are sunken down, or completely gone. The body is flabby. The abdominal walls are soft, pulpy, and discolored. The abdomen of round putrid fish is bloated or may even have burst. Putrid fish float on water.

Frozen fish.—A fairly accurate check may be made of frozen fish by drilling three-fourths inch deep holes in them with a small three-eighths inch electric drill. The drill should be allowed to spin in the hole for a few seconds. Deteriorated fish will be recognized by a fleeting but unpleasant odor in the hole.

Shellfish, crabs, and oysters should not be accepted unless they are alive. Shucked oysters and clams should not be permitted to come in direct contact with ice. Frozen oysters are satisfactory only if kept continuously frozen. They should be packed in metal 1-gallon cans, refrigerated or surrounded by ice.

7. *Poultry* comprises chickens, turkeys, ducks, geese, guinea fowl, and pigeons. Chickens and turkeys are the chief items procured. Normally, the purchase of chickens is limited to broilers, fryers, fowl, and roasters. The purchase of turkeys is usually confined to young toms and hens.

Two kinds of dressing are permitted for chickens by Federal specifications:

Dressed.—Are undrawn chickens which have been killed, bled, and plucked.

Eviscerated.—Are chickens which have been prepared from dressed chickens which have been singed and from which the head, shanks at the hock joint, crop, windpipe, esophagus, entrails, gall bladder, lungs, kidneys, and oil gland have been completely removed. The carcass and the

giblets (heart, liver, and gizzard) should be thoroughly cleaned and drained. The giblets wrapped in nonabsorbent paper and placed in body cavity. The product should be chilled immediately, until delivery.

Four types of chickens are:

Type I.—Fresh chilled, cooled immediately after slaughter, kept at a temperature not above 45° F. and delivered within 48 hours.

Type II.—Fresh chilled-cooled by refrigeration, but without the tissues containing ice crystals. Carcasses should show no evidence of having been frozen or defrosted.

Type III.—Fresh hard-chilled are cooled by dry refrigeration to the extent that the carcasses are solidly frozen and held for not more than 2 months. The containers should be plainly marked with date of slaughter.

Type IV.—Storage are solidly frozen while in excellent condition and held for not more than 10 months. Fresh hard-chilled carcasses which show evidence of deterioration from freezing may be classed as storage stock if solidly frozen at time of delivery. The containers should show the date of slaughter, although this is not a requirement.

Turkeys are dressed and are of the same types as chicken.

Eggs are purchased according to specifications and should be weighed and candled. The specifications will state the weight per crate, and the size air bubble permitted in the type of egg purchased.

8. *Canned Food.*

(a) All canned goods should be examined carefully for evidence of defective containers. Such evidence is manifested by marked denting or rusting, leaking, loss of the normal concavity of one or both ends of the can, or by actual bulging of one or both ends of the can.

(b) Serious denting may permit leakage or contamination. If an end of the can is concave showing the continued presence of the vacuum, the can may be safely used, provided the odor and appearance of the contents are normal. The same general rule may be applied to rusting.

(c) All cans showing any bulging should be destroyed.

(d) The loss of the normal concavity of the ends of

cans signifies improper canning or the formation of a small amount of gas or a small leak and should be cause for rejection.

9. *Other References.*—For further information on inspection of foods, requirements and specifications, reference should be made to the *Manual of Naval Hygiene and Sanitation*, NavMed P-126, Federal Specifications on Food, if available, and Joint Army and Navy Department specifications.

STORAGE AND PRESERVATION OF PROVISIONS

1. *Supply Dumps.*—Supply dumps should be protected against pilferage and against infestation by rodents and insects that will attend the littering of the area by food residue and opened food containers. Pallets or platforms 12 to 18 inches high should be used wherever practicable to minimize rat harborages.

2. *Canned Provisions.*—Canned foods, with the exception of canned cooked whole ham and dried beef, should be stored in dry, cool, well-ventilated spaces wherever practicable and should be placed on shelves or pallets. It is desirable that they be so arranged that they are used in the order received and with reference to the date of packing to prevent undue aging of stocks on hand. Canned cooked whole ham and dried beef are not sterile, are perishable, and should be stored in the chill room.

3. *Dry Provisions.*

(a) Dry provisions in general should be stored in a manner similar to canned goods, with the extra provision that ratproof containers or compartments be used wherever practicable.

(b) Bread should be protected against flies, roaches, mice, and rats. All bread should be kept, if practicable, in wax paper wrappers until needed. When returned from the mess hall it is placed in a bread basket and covered to prevent fly contamination.

4. *Fruits and Vegetables.*

(a) Proper storage and temperature conditions will pre-

vent much loss among foods of this type. Fruits and vegetables may be divided into three groups, as follows:

(1) Group I: Recommended storage temperature 32° to 33° F. and a relative humidity of 85 to 90 percent: Apples, cranberries, grapefruit, oranges, pears, plums, prunes, beans (snap and lima), beets (topped), celery, lettuce (Iceberg), parsnips, sweet peppers, rutabagas, turnips (topped).

(2) Group II: Recommended storage temperature 40° to 42° F. and a relative humidity of 85 to 90 percent: Honeydew melons, onions, and Irish potatoes. Compartments in which potatoes are stored must be kept dark. Onions keep well in the dark at 32° F. and a relative humidity of 70 to 75 percent, but should not be stored with Group I on account of their effect on taste of such articles as apples and grapefruit.

(3) Group III: Recommended storage temperature 55° to 58° F. and a relative humidity of about 85 percent: Lemons, sweet potatoes, winter varieties of squash, and green mature tomatoes.

(b) It should be remembered that the concentration of carbon dioxide developing from the respiration of vegetables and fruits in a closed compartment (such as the hold of a vessel) may reach a dangerous level; i. e. 5 percent or above. Deaths have been reported for men who descended into holds filled with fruit such as bananas. The precautions to be observed against these hazards are included in chapter III, *Manual of Naval Hygiene and Sanitation*, NavMed P-126.

5. *Dehydrated Vegetables*.—Dried vegetables are particularly useful during time of war because the shipping weight of the dried product is about one-fourth that of the fresh product and the storage space is greatly decreased. Cold storage is not required for their preservation. Their storage life is limited to about 6 months at high temperatures. For further information concerning dehydrated foods consult *The Cook Book of the U. S. Navy* and War Department Technical Bulletin, TBQM 45, *Dehydrated Foods*.

6. *Refrigeration*.—All readily perishable food and drink shall be kept refrigerated at the proper temperature except

when being prepared or served. Waste water from refrigeration equipment shall be disposed of properly. For complete information on storage and care of provisions, refer to the *Bureau of Supplies and Accounts Manual*.

7. *General Use and Care of Refrigerators.*

(a) Although food should be conserved when safely possible, many instances of injudicious saving occur. The storage in coolers of leftover chicken salad, creamed chicken, potato salad, macaroni and cheese, spaghetti and meat balls, custard pies, cream puffs, and the like especially is fraught with danger. If unable to serve them within 12 to 36 hours, it is wiser to discard, take the loss, and prepare less the next time.

(b) Foods should be neatly arranged in the refrigerator, pans of food not being stacked on one another or placed on deck. The racks should be cleansed with warm water weekly at least. Decks should be cleansed daily and scrubbed with hot soapy water every week at least. Meat hooks should be cleaned after use. It is well to have clean extra hooks kept in a box in the refrigerator ready for use.

(c) Overloading decreases the efficiency, makes cleansing more difficult and interferes with sanitation inspection of refrigerators.

8. *Fresh Meat.*

(a) For complete information on this subject, refer to *The Meat Handbook of the U. S. Navy*, Bureau of Supplies and Accounts Publication No. 55. Table No. 1-5 in the *Manual of Naval Hygiene and Sanitation*, taken from the *Bureau of Supplies and Accounts Manual*, gives approximate maximum storage periods for representative meat items at various storage temperatures and should serve as a general guide for the Medical Department and commissary personnel. The table is based on the following temperatures, recommended as optimum for refrigerated spaces ashore and afloat: chill space, 30° to 34° F.; freezer space, 0° F., or lower preferred, thaw room, 36° to 38° F.

9. *Dairy and Poultry Products.*—Dairy and poultry products should be refrigerated as follows:

	<i>Degrees F.</i>
Fluid milk.....	31-33
Cream.....	31-33
Butter, for holding not longer than 1 month.....	31-33
Butter, for holding longer than 1 month.....	0
Cheese, Cheddar, for not longer than 2 months.....	38-40
Cheese, Cheddar, for longer than 2 months.....	31-33
Eggs, fresh, shell, for longer than 1 month.....	31-33

10. *Fresh Fish and Fowl*.—All fresh fowl, fish, oysters, etc., should be used as soon as possible. They should never be held longer than 24 hours at a temperature of 34° F. to 38° F.

11. *Surface Mold of Hams and Bacon*.—Hams and bacon which have been individually wrapped in one or more layers of paper have a tendency to retain on the surface any moisture which may have come from the product after wrapping. This moisture in a measure stimulates mold or bacterial growth if hams so wrapped are held at temperatures of 45° F. or above for a considerable length of time. Mold will grow on a surface, and the surface of the meat will become more or less slimy due to bacterial growth. Surface slime and mold make the hams unattractive and unpleasant to handle. To the uninitiated such hams may appear spoiled. However, surface mold and sliminess on hams rarely, if ever, render them unsatisfactory for food and they should not be surveyed or rejected for surface mold and slime alone. In most cases where this condition has been allowed to develop on hams and bacon, the product can generally be overhauled by trained commissary personnel in such a way that it is perfectly fit for food.

12. *Use of Cracked Ice*.—Ice exposed to contamination should not be used in drinks, unless rinsed off with potable water and then chipped or ground in the establishment where used. Ice for this purpose taken from wet boxes should be thoroughly rinsed.

13. *Preservation of Prepared Foods*.

(a) **Prepared Foods**.—No prepared food should be permitted to remain at room temperature for more than four hours. Cooked ham, hash, chicken-a-la-king, fish of any type, meat or potato salads, fowl dressing and cream-filled pastries should not be allowed to remain at room tempera-

ture for longer than two hours (cumulated time) prior to consumption. As soon as such foods are cool enough to handle they should be placed in shallow pans to a depth of not greater than 3 inches and put in the chill box until just prior to serving, if it is intended that such foods shall be held longer than two hours.

(b) **Dehydrated Foods.**—These foods after reconstitution should not be allowed to remain at room temperature more than three hours from the time water is added until served.

(c) **Quick-Frozen Foods.**—When these foods have been defrosted they are highly perishable, and should be used immediately after defrosting.

PREVENTION OF FOOD POISONING

1. *General.*—While food usually is considered in its relation to the maintenance of bodily health and efficiency it is sometimes injurious to health. Animal foods convey infections or have properties injurious to health more frequently than those obtained from plants, and meat and milk are principal offenders.

Food may affect health as a result of: (1) Natural poisons contained in it as some mushrooms, some fish, etc.; (2) Animal parasites or their eggs or larvae contained in or conveyed by foods; (3) Bacteria conveyed by both animal and vegetable foods, as tubercle bacilli, typhoid, paratyphoid, and dysentery bacilli, streptococci, etc.; (4) Toxins developing in foods as a result of bacterial growth, as staphylococcus enterotoxin, botulism; (5) Special poisons contained in foods, as solanin in sprouted potatoes; (6) Poisons accidentally or purposely added, as arsenic, lead, acids, insect powders, etc.; (7) Amount, too little or too much; (8) Composition, an unbalanced diet; (9) Faulty digestion or disturbances of metabolism; and (10) Idiosyncrasy to certain foods.

Experience has shown that more than one-half of all reported food poisoning outbreaks are the result of gross carelessness and deficiencies in messing sanitation or insanitary

food handling. Outbreaks can be prevented by rigid maintenance of high standards in messing sanitation and food handling. Precautions with regard to food handler personnel are presented in chapters 6 and 17 of the *Handbook of the Hospital Corps* and chapter 3, *Manual of Naval Hygiene and Sanitation*. Commissary personnel should understand the ways, i. e., handling, slicing, chopping, pouring, stirring, etc., by which pathogenic organisms are introduced into food that will serve as a culture medium and they must realize the necessity for adequate refrigeration (below 45° F.) if serving of such food is to be delayed for a period of time. They should remember that uncovered containers of food, especially milk and other dairy products, invite contamination from a number of sources including droplet infection.

2. *Routine Precaution*.—Certain insanitary practices are frequently associated with food poisoning, outbreaks of gastroenteritis, and respiratory infections.

(a) Constant supervision is required to prevent the common practice of washing mess gear in water which is over 140° F. and subsequent sterilization in water below the standard temperature of 180° F. Adequate facilities must be provided (in most instances “booster heaters” are required) to maintain a continuous flow of water at the minimum safe “sterilization” temperatures.

(b) Under no circumstances should drying of mess gear after washing and sterilizing be done by means other than air drying. The use of dish towels and other cloths for this purpose should not be permitted.

3. *Food Poisoning*.—Food poisoning can cause acute attacks of illness in more men in a short time than any other condition. The term “food poisoning” is conventionally divided into two groups, food intoxication and food infection.

4. *Food Intoxication*.—Food intoxication is due to a specific toxin produced outside the body, for example the toxin of botulism. Botulism is no longer a problem except in home-canned vegetables and meats. Other organisms cause food intoxication by producing toxins the exact nature of which is imperfectly understood. These toxins are formed under suitable conditions usually by staphylococci, occa-

sionally by streptococci, and rarely by coliform, proteus, and possibly salmonella organisms. The general symptoms of food intoxication, caused by other than the *Clostridium botulinum*, are similar to those due to food infection, (i. e. nausea, vomiting and diarrhea), but the time interval of onset is shorter—half an hour to 4 hours—vomiting is more violent, and prostration more severe, there is usually less fever and recovery is more rapid.

The type of food associated with such outbreaks varies considerably. Ham is one of the most common foods. Others include canned or potted meat or fish, pressed tongue, beef, cheese or milk products, potato salad and macaroni salad. The usual source of the germs which cause this form of food intoxication come from boils, pimples, and infected cuts on the hands of those who prepared the food.

Besides the toxins or poisons produced by bacterial growth, certain foods are inherently poisonous. The following cause predominantly nervous symptoms (weakness, or paralysis, numbness, tingling of ears, apprehension, and finally death): toadstools, hemlock, mussels in California during the summer, tropical fish such as toadfish, puffer fish, certain members of the jackfish family, and in tropical waters at certain seasons of the year, barracuda.

Metallic poisons may be arsenic as residues of spray on fruit, or cadmium or zinc dissolved by acid foods such as lemonade, jello, tomatoes, etc., from cadmium plated or galvanized iron cans. (Ice trays in refrigerators are particularly dangerous if cadmium plated.) Metallic poisons generally cause violent nausea, vomiting and diarrhea very shortly after ingestion.

5. *Food Infection*.—Food infection is usually caused by a specific group of organisms, namely the *Salmonella* group, but occasionally the *Dysentery* group. Food infection is characterized by a sudden onset with headache, followed by nausea, vomiting, diarrhea, abdominal pain or distress, prostration, and sometimes fever, and usually commencing from 6 to 24 hours after ingestion of food. The causative organism may be revealed by examination of the vomitus and feces.

The great majority of outbreaks are caused by meat or meat mixtures. The meat may come from an animal infected during life with a specific organism; or it may come from a healthy animal and be infected during the process of slaughtering and handling. Such sources of infections are best controlled by meat inspectors at slaughterhouses. Food handlers with hands not thoroughly washed after leaving the toilet are often the source and the means of conveying contamination to food. The entrails of fowl contaminating the butcher block or cutting table is another common source. Food may also be infected by flies, cockroaches, rats, mice, and polluted water when used in cooking and preparation of food.

Food which most often cause food poisoning are mixtures with meat as a basis, such as ham, hash, meat or fowl, veal and cream pies, meat, crab, lobster and chicken salads, hamburger steak, and cold sliced meat. Veal mixtures are a frequent cause. Ham is most commonly infected with staphylococcus because of the common practice of boning and slicing hours before serving. Milk and egg products also have been reported as causes of outbreaks.

Foods that have caused trouble have the following in common: they provide a good medium for growth of bacteria. They are first contaminated at some point in preparation and are then allowed to stand in a warm place several hours, in some instances over night; and lastly are served cold or with inadequate re cooking. If they have been infected with one of the causative organisms, it may be readily seen that with moisture, a good protein food supply, and warmth, there is every desirable condition present for a large growth of bacteria and the production of much toxin.

The filling of cream puffs, cream pies, and custards and various sauces made from milk and cream have been the cause of outbreaks. Mixing of salads by hand, if the salad dressing or other ingredients will support bacterial growth, is another cause.

It is important to remember that the organisms which cause food infection do not necessarily cause any alteration

in the normal appearance, odor, or taste of the food. A classic example of this occurred in connection with an outbreak in Ghent, Belgium. A meat inspector was so certain that the suspected meat had no connection with the trouble that he ate three slices to demonstrate their harmlessness. He suffered a severe attack of gastroenteritis and died five days later. Bacterium enteritis was isolated from his viscera at autopsy.

6. *Preventive Measures.*—The preventive measures are plainly indicated by the sources of the infection. Meats should be procured only from carefully inspected slaughterhouses, and cured as well as uncured meats should be properly refrigerated.

On board ships, no food, especially meat mixtures, should be prepared and then set aside to be served at a subsequent meal. The time between the preparation and serving of the food should be reduced to a minimum. If it becomes necessary to hold over any food, it should be put in shallow pans and stored in a cold refrigerator as soon as possible and kept cold until it is to be served or prepared for serving. Refrigerator stowage must be watched to assure free circulation of cold air to all sides of the stored food.

Experience has indicated that it is not good policy to prepare sandwiches containing meat, fish and fowl, or meat products that are to be served several hours after preparation unless the sandwiches can be kept under constant refrigeration. If made from canned meats or meat products, they should be prepared only by opening the can immediately before serving. If galley cooked meats are used, the sandwiches should be prepared in the galley and kept constantly refrigerated during the time prior to serving. It is suggested that the unopened cans of meat or meat products with the necessary bread be sent ashore for sandwich preparations by beach parties just before serving whenever there is a possibility that meat sandwiches prepared on board ship or at a shore station would not be consumed within three to four hours after preparation.

A high standard of sanitation in the galley and butcher's shop is very important. The personal hygiene of the cooks

and handlers of food should be looked into; particularly their attention to the important detail of thoroughly washing their hands after visiting the toilet. They should be watched constantly for symptoms of intestinal disturbances and no men allowed to handle or prepare food who are suffering from any signs of gastrointestinal upset. After suffering with dysentery, a food handler should be excluded from food handling for at least a month unless bacteriological examinations have shown him to be free of dysentery germs at an earlier date.

7. *Investigation.*—Immediately after an outbreak occurs an effort should be made to get samples of the last meal served so that they can be examined in a laboratory. As soon as care of the sick permits, an epidemiological study of the outbreak should be undertaken. The patients should be questioned regarding the foods eaten and the messes in which they were eaten. Unaffected members of the same mess should be interrogated as to whether they ate the same foods. Men frequently eat the same foods, but because of immunity, eating very small portions, or an unequal distribution of the infection throughout the food mass, are not affected.

The following information should be gathered by questioning each person affected. This information could be charted to facilitate a conclusion as to the causative agent:

- (a) Name and rate.
- (b) Time illness was noticed.
- (c) What was eaten during the past 24 hours at meals and food not on the menu.
- (d) What symptoms were experienced, i. e., nausea, vomiting, diarrhea, and other conditions.
- (e) Have symptoms been experienced previously and when.
- (f) Other remarks that may be elicited by further questioning.

By careful study of the above information one can arrive at a fairly accurate idea of the food responsible for the outbreak. Certain foods, by their nature, would ordinarily be suspected, others not. If some men were affected yet

did not eat the suspected food, that food should be ruled out. Specimens of the urine and feces from the more severe cases should be collected and sent as soon as possible to the nearest hospital or clinical laboratory for examination.

Food handlers should be brought under observation for medical and bacteriological examination to determine possible origin, whether from infections of the skin or bowel discharges. The germs from tonsillitis and sore throats may occasionally be at fault.

In addition to the above, as soon as practicable, after it is evident that a food infection has occurred, the galley and messhall should be investigated to determine the exact menu served, when and by whom each article of food was prepared, what time it was prepared, how it was stored before it was served and by whom it was served.

Following an outbreak, effort should be made to obtain specimens of the responsible food and have them examined at the nearest naval hospital or epidemiological laboratory. Specimens in sterile containers can be sent to the U. S. Naval Medical Center, Bethesda, Maryland.

INSTRUCTION TEST

Assignment No. 1

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. The Medical Department is responsible for the of all foods which are used in the Navy.
2. Meats used for food purposes generally come from the flesh of beef, swine, lamb, fish, and fowl; flesh may be defined as any edible part of the muscle.
3. All meats accepted in the Navy must bear the stamp of the Meat Inspection Division, Department of
4. Beef is graded on a composite evaluation of three general factors: Conformation, finish,
5. The quality of lean meat of beef is indicated by its texture and

6. The better quality beef has ----- streaks interspersed with the lean meat, known as "marbling," and the color is -----.
7. There are seven grades of beef from ----- and heifers. These are Prime, Choice, Good, Commercial, Utility, Cutter, and -----.
8. Only meat procured from steers and heifers will qualify for ----- grade beef.
9. Meat should always be inspected by a medical officer or the Medical Department representative for quality (condition) since considerable time may elapse between date of inspection by U. S. Agriculture Department and date of ----- to the consumer.
10. The quantity of fat on the carcass of beef and the distribution of fat is referred to as -----.
11. Meat carcasses and cuts may be delivered "fresh chilled" or "-----."
12. Meats that have been held at temperatures just above freezing, and have not been frozen are known as "-----" meats.
13. Fresh chilled meat that is not -----, that is firm and ----- to the touch, reasonably dry, and free from slime or slimy deposits and abnormal ----- may be generally considered to be sound and wholesome.
14. The lean of frozen meat is usually ----- in color than fresh chilled meat of the same grade.
15. Classes of meat refer to the size and ----- of the carcass.
16. Grades of meat refer to the shape or "build" of the carcass or cut, known as -----.
17. Undesirable characteristics to look for when inspecting fresh chilled meat are: (1) extensively moist, sticky or ----- surface; (2) extreme -----; (3) abnormal -----; and (4) presence of edema or emphysema.
18. A skewer thrust into the depths of cuts of fresh chilled meat near ----- or bone should have no unpleasant odor when withdrawn.
19. Inspection of frozen meat items should be made with a view to determining whether or not conditions of ----- and ----- have been such as to maintain these items in frozen condition at all times.
20. Alternate freezing and thawing of frozen meat is objectionable and ----- the storage life of the meat.
21. Surface mold on cured and smoked meats such as hams and bacon may be present ----- rendering them unfit for food.
22. Veal is the flesh of young bovine animals, usually not over ----- weeks old.

23. Calf carcasses are usually coarser in texture than veal and the flesh is a ----- red color.
24. Pork carcasses of good quality should be free from ----- and discoloration.
25. Lamb is a general term which refers to the flesh of young animals of the ovine species of both sexes up to about 12 ----- of age.
26. Carcasses of the ovine series which have passed the lamb stage are called -----.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

27. The prevention of trichinosis may be accomplished by heating all pork or pork products to a temperature not lower than
 1. 100° F.
 2. 110° F.
 3. 120° F.
 4. 137° F.
28. All fresh fowl, fish, and oysters should be used as soon as possible. They should never be held at a temperature of 34° F. to 38° F. longer than
 1. 24 hours
 2. 48 hours
 3. 60 hours
 4. 72 hours
29. Which one of the below listed conditions would be considered as a cause for rejecting fish as unfit for preparing as food?
 1. The gills have a bright color, and gill covers and mouth are closed.
 2. When laid across the hand the fish will not bend, and it sinks in water.
 3. The scales are firmly adherent and glittering.
 4. The eyes are red—bordered and cloudy, the body feels bony and bends easily, the flesh is soft and easily removed from the bone, finger impressions are easily made in the flesh and remain, and the fish float in water.

MATCHING ITEMS

To the right of each phrase or symbol in list *B* write the number of the one most closely related item in list *A*.

30. Match the following described animals with the appropriate descriptive explanation which applies to each of them

A	B
1. steers	males of bovine species castrated
2. heifers	after reaching maturity -----
3. cows	adult males of bovine species,
4. bulls	castrated when young -----
5. stags	young females of bovine species
6. barrows	not fully matured, which have
	never borne young -----
	mature females of bovine species,
	which have usually borne young -----
	mature males of bovine species -----

INSTRUCTION TEST

Assignment No. 2

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. Fresh shellfish, crabs, and oysters should not be accepted unless they are -----
2. Frozen oysters are satisfactory only if kept continuously ----- until ready for use.
3. Canned goods should be examined carefully for evidence of ----- containers.
4. All cans of canned goods showing any bulging should be -----
5. The loss of the normal concavity of the ends of cans signifies improper canning or the formation of a small amount of gas or a small leak and should be cause for ----- at time of receipt.
6. The two kinds of dressing for chicken allowed by Federal specifications are dressed and -----
7. Supply dumps should be protected against infestation by insects and -----
8. Canned foods should be stored in dry, cool, well----- spaces on shelves or pallets.

9. Canned, cooked whole ham and dried beef are not sterile, are perishable, and should be stored in the room.
10. Bread should be protected against,, and
11. When bread is returned from the messhall it should be placed in a bread basket and to prevent fly contamination.
12. Quick-frozen foods that have been defrosted are highly, and should be used after defrosting.
13. Past experience has shown that one-half of all reported food poisoning outbreaks are the result of gross carelessness and deficiencies in sanitation or insanitary food
14. Dehydrated foods, after reconstitution, should not be allowed to remain at room temperature more than hours from the time water is added.
15. The storage in coolers of leftover chicken salad, creamed chicken, potato salad, macaroni and cheese, spaghetti and meat balls, custard pies and cream puffs is dangerous. If unable to serve in to hours they should be discarded.
16. Foods that cause food poisoning have the following in common: they provide a good medium for growth of, they are first contaminated at some point in preparation and are then allowed to stand in a place for several hours or more, and they are served or with inadequate re cooking.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

17. The temperature of water for the rinsing (sterilization) of mess gear should be
 1. 130° F.
 2. 145° F.
 3. 160° F.
 4. 180° F.
18. Foods such as cooked ham, hash, chicken-a-la-king, fish, meat or potato salads, fowl dressings and cream-filled pastries should *not* be allowed to remain at room temperature for longer than
 1. 2 hours (cumulated time) prior to consumption
 2. 4 hours (cumulated time) prior to consumption
 3. 6 hours (cumulated time) prior to consumption
 4. 8 hours (cumulated time) prior to consumption

19. The recommended storage temperature for fruits and vegetables such as apples, cranberries, oranges, pears, beans (lima and snaps), beets, celery, lettuce and turnips is

1. 5° to 10° F.
2. 15° to 20° F.
3. 32° to 33° F.
4. 40° to 50° F. -----

20. Concentration of carbon dioxide developing from the respiration of vegetables and fruits in a closed compartment, such as the hold of a vessel

1. may cause bad odors, produce no ill effects to personnel entering hold
2. may reach a dangerous level and cause death to personnel entering hold
3. may at most, cause temporary headache to personnel entering hold
4. cannot at any time reach a dangerous level -----

CHEMISTRY

Chemistry is the study of matter—its structure and change. It also considers the amounts and kinds of energy needed to make these changes, and the physical laws which govern them.

Matter

Matter is anything that occupies space and has mass (weight). In all ordinary changes, matter can neither be created nor destroyed. Recently, it has been shown that under certain extraordinary conditions, matter can be converted to energy.

Matter may exist in any of three states: gaseous, liquid, or solid.

Solids are rigid and retain their form.

Liquids flow and tend to assume the shape of the container in which they are placed.

Gases diffuse to fill completely the container in which they are placed. The particular state of matter at any given time usually depends on two conditions, namely its temperature and the pressure which is exerted on it.

For example, at ordinary temperatures and pressures, water is a liquid. But, if the temperature is increased beyond a certain point, the water changes to steam, a gas. On the other hand if the temperature is decreased, the water will change, at its freezing point, to the solid: ice.

Matter that is homogenous, such as water, iron, steel, salt, or air, is called a substance.

Properties—Identification of Matter

Properties are the characteristics of matter. They may be physical, such as color, odor, taste, solubility, melting point, boiling point; or chemical such as energy content, or the way a substance reacts when subjected to heat, light, electricity, or the action of some other substance. It is through the systematic study of these properties that the chemist is able to isolate, identify, and determine any given substance.

Classification of Matter

A pure substance can be placed in one of two classifications. It is either an element or a compound. An element is a substance that cannot be decomposed into two or more simpler substances by present, ordinary, chemical methods.

For example; iron, oxygen, chlorine, mercury, carbon, lead, and the other elements listed in table 4. A compound is a substance composed of two or more elements combined chemically in definite proportions by weight. The constituents of a compound can only be separated by chemical means, and do not retain their original properties. Take for example, water. It is composed of the two elements, hydrogen and oxygen. Both are gases. Hydrogen burns and oxygen supports combustion, yet, water, their common compound, is universally used to combat fire. Sodium and chlorine, two violently poisonous elements, combine to form salt, a compound that is absolutely essential to life.

The question now arises, suppose a substance is not pure? This matter then, is a mixture of elements or compounds or both which can be separated by other than chemical methods. A mixture may or may not be homogenous. Its components are not necessarily chemically combined nor combined in definite chemical proportions. The properties of the mixture, as a whole, are a composite of the individual properties of its components. For example, take a mixture of salt and water. It may be anything from wet salt to salty water (composition indefinite—individual properties retained). It may be separated simply by distilling the water from the mixture.

Classification of Elements

The elements have been carefully studied and it has been found that practically all of them can be made to react with oxygen to form compounds called oxides. If the oxide of a metal is placed in water, the mixture will be basic, and if the oxide of a nonmetal is placed in water, the mixture will be acid. There are some elements whose oxides in water are either acid or basic. Those elements are amphoteric. Those elements that cannot be made to react with oxygen are generally classed as nonmetals.

TABLE 2.—Classification of Some of the Elements

Metals	Amphoteric elements	Nonmetals
Sodium. Potassium. Calcium. Iron. Mercury. Copper. Silver.	Zinc. Aluminum. Arsenic. Iodine.	Silicon. Oxygen. Carbon. Sulfur. Chlorine. Neon. Helium.

Classification of Compounds

There are many systems used to classify compounds. However, all these systems follow the principle of grouping together compounds having like properties or origin. For example:

1. The acid-base system (in water):

Acids.—Compounds containing loosely bound hydrogen that can be replaced easily by a metal (e. g.—hydrochloric acid, sulphuric acid).

Bases.—Compounds that will react with acids to form *salts* and, generally, water (e. g.—lye, slaked lime, ammonia water).

Salts.—Compounds produced by the reaction of an acid with a base (e. g.—table salt: sodium chloride, or Epsom salts: magnesium sulfate).

2. By origin:

Organic.—Compounds that are derived from carbon.

Inorganic.—Compounds that are not derived from carbon.

Energy

Energy, a universal property of matter, is the ability to do work. Although matter may contain energy that is not available for work, the rest of the energy may be caused to express itself in any of a number of forms:

Potential energy.—Is the inherent energy of an object at rest. It is stored or available energy.

Kinetic energy.—Is the energy of motion or action. It may take the form of heat, light, electricity, motion or chemical reaction.

Like matter, in ordinary chemical changes, energy can neither be created nor destroyed. This is a statement of the "Law of Conservation of Energy."

Changes

Changes in matter are brought about by the action of energy. They are generally classed in two general groups: Physical changes are those which can be easily reversed and do not permanently alter the properties of matter (e. g.—the freezing of water). Whereas, in chemical changes, the substances undergoing the change, lose their original identity. When natural gas is burned, it forms water and carbon dioxide. Chemical changes are called "reactions."

Atomic Structure

The atom is the smallest particle of a chemical element to retain the properties of the element. Since this is the fundamental unit of any substance, we should examine it briefly to learn how and why it functions. In a series of brilliant experiments, many scientists, working independently, deduced the structure of the atom.

All atoms contain three types of particles called protons, neutrons and electrons.

The **proton** is the unit of positive electricity. That is, it has a charge of plus one. It has a mass of approximately one on the atomic weight scale. It is found concentrated in the nucleus (center) of the atom.

The **neutron** is a neutral particle bearing no electric charge. Its mass is approximately the same as that of the proton. It, too, is found in the nucleus. Notice that practically all the mass of an atom is concentrated in a very small part, the nucleus.

The **electron**, the unit of negative electricity, carries a charge of minus one; its mass is approximately $1/1838$ of the mass of a proton. The electrons travel in definite circular paths, or orbits, about the nucleus, much in the same manner that the planets travel about the sun. In any free atom there are exactly as many "orbital" electrons as there are protons in the nucleus, the number of orbits depending on the total number of electrons. Each orbit is saturated with electrons before the next is started. The orbit farthest from the nucleus may contain no more than eight electrons (except in the case of palladium). The following table gives the maximum number of electrons in any given orbit, and name of the orbit. They are listed in order of increasing distance from the nucleus.

TABLE 3

Orbit No.	Orbit name	Maximum number of electrons	Orbit No.	Orbit name	Maximum number of electrons
1.....	K	2	5.....	O	32
2.....	L	8	6.....	P	18
3.....	M	18	7.....	Q	8
4.....	N	32			

The electrons in the outermost orbit are responsible for all the chemical properties of the element involved. Each element has a characteristic "atomic number" and "atomic weight." By the use of these two values it is possible to deduce the structure of any atom.

To illustrate, let us take an element whose atomic number is 6 and whose atomic weight is 12. The atomic number is equal to the number of protons in the nucleus. Therefore, an atom of this element has 6 protons (6 plus). Since the weight of an atom is equal to the protons plus the neutrons, the atom has; No. of neutrons=atomic weight—atomic number ($12-6=6$ neutrons). The number of electrons being equal to the number of protons means that the atom has six orbital electrons (6 minus). The structure is illustrated in figure 1 and is an atom of carbon.

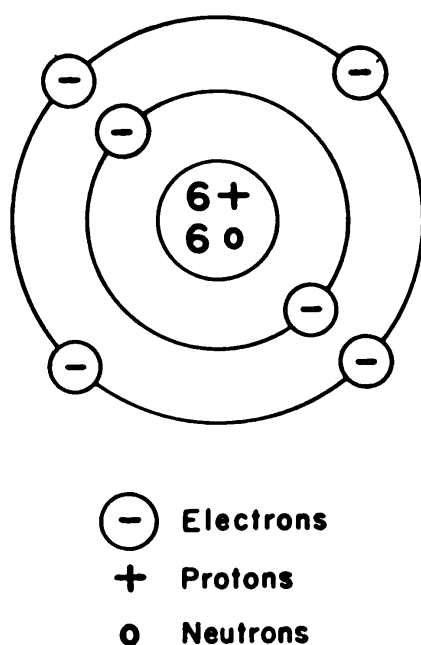


Figure 1.—Diagram of atom of carbon.

The atomic number and the atomic weight of any element (and generally the electron distribution) may be found in the “periodic chart” of the elements or in any of several tables devoted to that purpose.

Isotopes

All of the atoms of any given element have the same atomic number. This is what characterizes the atom as being a particular element. The atomic weight, on the other

hand, may vary. Yet the chemical properties remain the same. The atoms whose atomic weights differ from that of the most common atoms are called isotopes. Normally an element exists as a mixture of the various natural isotopes. This accounts for the fractional atomic weights listed for the element as a whole.

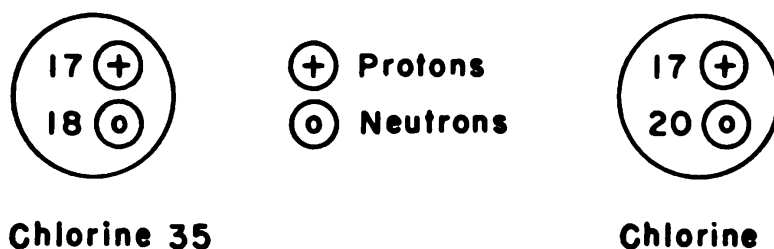


Figure 2.—Diagram of the nuclei of the chlorine isotopes.

Thus chlorine exists as a mixture of 77 percent “chlorine 35” and 23 percent “chlorine 37,” having atomic weights of 35 and 37, respectively. The atomic weight listed for natural chlorine is about 35.46 which represents the weighted average.

$$\begin{array}{r}
 77 \text{ percent of } 35 = 26.95 \\
 23 \text{ percent of } 37 = 8.51 \\
 \hline
 \end{array}$$

$$100 \text{ percent of chlorine mixture} = 35.46$$

The only way in which the weight of an atom can vary without changing the atomic number is to vary the number of neutrons in the nucleus. Therefore, the only difference between the isotopes of an element is the number of neutrons in the nucleus.

The isotopes of an element, having like chemical properties, can only be separated by physical means such as diffusion.

The Periodic Chart of the Elements

Careful study has shown that the properties of the elements vary as a periodic function of their atomic numbers. This means that when the properties of the elements are listed in the order of increasing atomic number, that every

SIMPLIFIED PERIODIC CH

METALS

NORMAL ELEMENTS		TRANSITIONAL ELEMENTS																
I A		II A		III B		IV B		V B		VI B		VII B		VIII B				
2 1	3 Li 6.940	4 Be 9.013		2 8 9 2	21 Sc 44.96	2 8 10 2	22 Ti 47.90	2 8 11 2	23 V 50.95	2 8 13 1	24 Cr 52.01	2 8 13 2	25 Mn 54.93	2 8 14 2	26 Fe 55.85	2 8 15 2	27 Co 58.94	
2 8 1	11 Na 22.997	2 8 2	12 Mg 24.32	2 8 9 2	2 8 18 9 2	39 Y 88.92	2 8 18 10 2	40 Zr 91.22	2 8 18 12 1	41 Nb 92.91	2 8 18 13 1	42 Mo 95.95	2 8 18 13 2	43 Tc 99	2 8 18 15 1	44 Ru 101.7	2 8 18 16 1	45 Rh 102.91
2 8 18 8 1	19 K 39.100	2 8 18 8 2	20 Ca 40.08	2 8 18 9 2	57-71 LANTHANIDE SERIES	2 8 18 32 10 2	72 Hf 178.6	2 8 18 32 11 2	73 Ta 180.88	2 8 18 32 12 2	74 W 183.92	2 8 18 32 13 2	75 Re 186.31	2 8 18 32 14 2	76 Os 190.2	2 8 18 32 17	77 Ir 193.1	
2 8 18 32 18 8 1	37 Rb 85.48	2 8 18 8 2	38 Sr 87.63	2 8 18 9 2	89- ACTINIDE SERIES													
	55 Cs 132.91	2 8 18 10 8 2	56 Ba 137.36															
	87 Fr 223	2 8 18 32 18 8 2	88 Ra 226.05															
		RARE EARTH																
LANTHANIDE SERIES		2 8 18 19 9 2	57 La 138.92	2 8 18 19 9 2	58 Ce 140.13	2 8 18 20 9 2	59 Pr 140.92	2 8 18 22 8 2	60 Nd 144.27	2 8 18 23 8 2	61 Pm 147	2 8 18 24 8 2	62 Sm 150.43	2 8 18 25 8 2	63 Eu 152.0			
ACTINIDE SERIES		2 8 18 32 18 9 2	89 Ac 227	2 8 18 32 19 9 2	90 Th 232.12	2 8 18 32 20 9 2	91 Pa 231	2 8 18 32 21 9 2	92 U 238.07	2 8 18 32 22 9 2	93 Np 237	2 8 18 32 23 9 2	94 Pu 239	2 8 18 32 24 9 2	95 Am 241			

ART OF THE ELEMENTS

HYDROGEN		NONMETALS																INERT GASES		
1 H 1.0080																		VIII A		
		NORMAL ELEMENTS																		
		III A		IV A		V A		VI A		VII A										
		3 B 10.82	4 C 12.010	5 N 14.008	6 O 16.000	7 F 19.00	8 Ne 20.183													
		13 Al 26.98	14 Si 28.09	15 P 30.975	16 S 32.066	17 Cl 35.547	18 Ar 39.944													
		I B		II B																
28 Ni 58.69	29 Cu 63.54	30 Zn 65.38	31 Ga 69.72	32 Ge 72.60	33 As 74.91	34 Se 78.96	35 Br 79.916	36 Kr 83.80												
46 Pd 106.7	47 Ag 107.88	48 Cd 112.41	49 In 114.76	50 Sn 118.70	51 Sb 121.76	52 Te 127.61	53 I 126.91	54 Xe 131.3												
78 Pt 195.23	79 Au 197.2	80 Hg 200.61	81 Tl 204.39	82 Pb 207.21	83 Bi 209.00	84 Po 210	85 At 210	86 Rn 222												

ELEMENTS

64 Gd 156.9	65 Tb 159.2	66 Dy 162.46	67 Ho 164.94	68 Er 167.2	69 Tm 169.4	70 Yb 173.04	71 Lu 174.99
96 Cm 242	97 Bk 243	98 Cf 244	99	100	101	102	103

so often an element occurs whose properties are similar to those of a previous element. From these observations, it was found that if each period, or series, were placed below the previous period that the elements of similar properties would fall in columns, while at the same time preserving the original order in which they were placed.

This chart serves as a condensed and easily-referred-to index of the properties of the chemical elements. It is reproduced on pages 32 and 33 in a simplified form.

The following information is readily obtained from this periodic chart:

1. The atomic number.
2. The atomic weight.
3. The distribution of electrons in the orbits.
4. The chemical symbols of the elements.
5. The chemical properties of the elements.

Key to the Periodic Chart of the Elements

GROUP NO.	
ELECTRON DISTRIBUTION BY ORBITS	K
	L
	M
	N
	O
	P
	Q
<p style="text-align: center;">ATOMIC NUMBER</p> <p style="text-align: center;">SYMBOL</p> <p style="text-align: center;">ATOMIC WEIGHT</p>	

Since the properties of the elements within the same group (column) are similar, the properties of an element are easily derived from its position on the periodic chart.

TABLE 4.—Table of Atomic Weights Listed Alphabetically by
Names of Elements

Element	Symbol	Atomic No.	Atomic weight ¹
Actinium.....	Ac	89	227
Aluminum.....	Al	13	26.98
Americium.....	Am	95	(241)
Antimony.....	Sb	51	121.76
Argon.....	A	18	39.944
Arsenic.....	As	33	74.91
Astatine.....	At	85	(210)
Barium.....	Ba	56	137.36
Berkelium.....	Bk	97	(243)
Beryllium.....	Be	4	9.013
Bismuth.....	Bi	83	209.00
Boron.....	B	5	10.82
Bromine.....	Br	35	79.916
Cadmium.....	Cd	48	112.41
Calcium.....	Ca	20	40.08
Californium.....	Cf	98	(244)
Carbon.....	C	6	12.010
Cerium.....	Ce	58	140.13
Cesium.....	Cs	55	132.91
Chlorine.....	Cl	17	35.547
Chromium.....	Cr	24	52.01
Cobalt.....	Co	27	58.94
Copper.....	Cu	29	63.54
Curium.....	Cm	96	(242)
Dysprosium.....	Dy	66	162.46
Erbium.....	Er	68	167.2
Europium.....	Eu	63	152.0
Fluorine.....	F	9	19.00
Francium.....	Fr	87	(223)
Gadolinium.....	Gd	64	156.9
Gallium.....	Ga	31	69.72
Germanium.....	Ge	32	72.60
Gold.....	Au	79	197.2
Hafnium.....	Hf	72	178.6
Helium.....	He	2	4.003
Holmium.....	Ho	67	164.94
Hydrogen.....	H	1	1.0080
Indium.....	In	49	114.76
Iodine.....	I	53	126.91
Iridium.....	Ir	77	193.1
Iron.....	Fe	26	55.85
Krypton.....	Kr	36	83.80
Lanthanum.....	La	57	138.92
Lead.....	Pb	82	207.21
Lithium.....	Li	3	6.940
Lutetium.....	Lu	71	174.99
Magnesium.....	Mg	12	24.32
Manganese.....	Mn	25	54.93
Mercury.....	Hg	80	200.61
Molybdenum.....	Mo	42	95.95

¹ A value given in parentheses denotes the mass number of the most stable known isotope.

TABLE 4.—Table of Atomic Weights Listed Alphabetically by Names of Elements—Continued

Element	Symbol	Atomic No.	Atomic weight ¹
Neodymium	Nd	60	144. 27
Neon	Ne	10	20. 183
Neptunium	Np	93	(237)
Nickel	Ni	28	58. 69
Niobium (Columbium)	Nb(Cb)	41	92. 91
Nitrogen	N	7	14. 008
Osmium	Os	76	190. 2
Oxygen	O	8	16. 0000
Palladium	Pd	46	106. 7
Phosphorus	P	15	30. 975
Platinum	Pt	78	195. 23
Plutonium	Pu	94	(239)
Polonium	Po	84	210
Potassium	K	19	39. 100
Praseodymium	Pr	59	140. 92
Promethium	Pm	61	(147)
Protactinium	Pa	91	231
Radium	Ra	88	226. 05
Radon	Rn	86	222
Rhenium	Re	75	186. 31
Rhodium	Rh	45	102. 91
Rubidium	Rb	37	85. 48
Ruthenium	Ru	44	101. 7
Samarium	Sm	62	150. 43
Scandium	Sc	21	44. 96
Selenium	Se	34	78. 96
Silicon	Si	14	28. 09
Silver	Ag	47	107. 880
Sodium	Na	11	22. 997
Strontium	Sr	38	87. 63
Sulfur	S	16	32. 066
Tantalum	Ta	73	180. 88
Technetium	Tc	43	(99)
Tellurium	Te	52	127. 61
Terbium	Tb	65	159. 2
Thallium	Tl	81	204. 39
Thorium	Th	90	232. 12
Thulium	Tm	69	169. 4
Tin	Sn	50	118. 70
Titanium	Ti	22	47. 90
Tungsten (Wolfram)	W	74	183. 92
Uranium	U	92	238. 07
Vanadium	V	23	50. 95
Xenon	Xe	54	131. 3
Ytterbium	Yb	70	173. 04
Yttrium	Y	39	88. 92
Zinc	Zn	30	65. 38
Zirconium	Zr	40	91. 22

¹ A value given in parentheses denotes the mass number of the most stable known isotope.

Valence

The valence of an element is defined as the number of atoms of hydrogen or chlorine that one atom of the element will hold or displace. The valence of an element shows how it will combine with other elements to form compounds. It is entirely due to the number of electrons in the outermost, or valence, orbit.

The most stable condition of an atom is when the valence orbit is saturated with electrons. That is, with eight electrons unless the outermost orbit is the "K" orbit then two electrons saturate the orbit.

Example.—Helium and Neon are completely chemically-inert. That is, having saturated outer orbits, they do not enter into chemical reactions. In order to achieve this stability, the atoms, other than the inert gases, will either give up, accept, lend, borrow, or share their valence electrons. For example.—

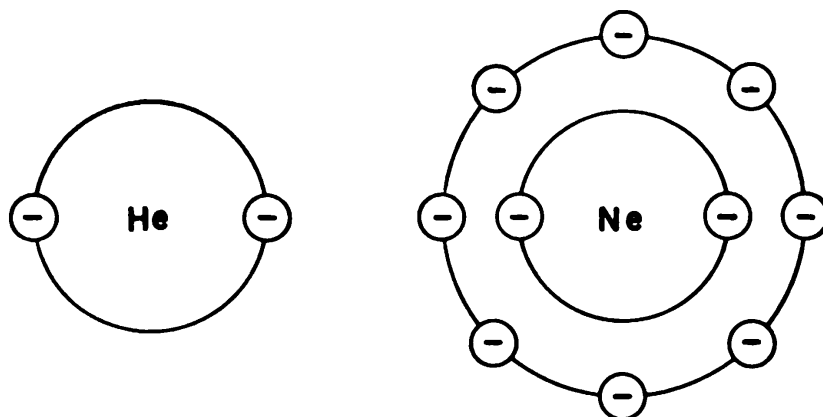


Figure 3.—Diagram of an atom of helium and neon.

The alkali metals (group IA) have one valence electron. The halogens (group VIIA) have seven valence electrons. Therefore, if an atom of an alkali metal gives its valence electron to an atom of halogen, the condition for stability is satisfied for both particles. But this leaves a positive charge on the alkali metal (more protons than electrons) and a negative charge on the halogen (more electrons than protons).

Since opposites attract, and since each particle carries a

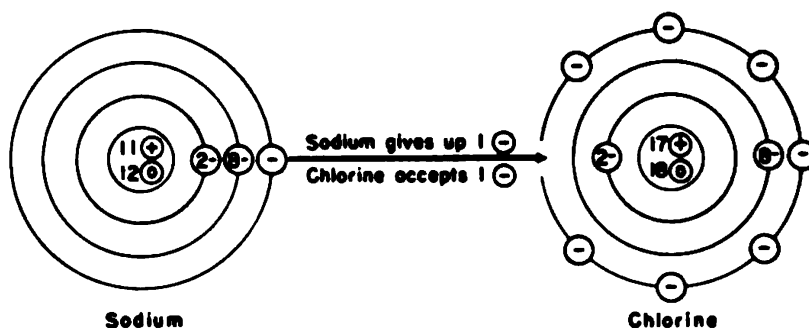


Figure 4.—The reaction of an atom of sodium and an atom of chlorine.

charge of one, one atom of the alkali metal pairs off with one atom of halogen.

The valence of the alkali metals (group IA) is plus one (each will hold only one atom of chlorine). And, the valence of the halogens (group VIIA) is a minus one.

By the same type of experimental reasoning it can be shown that the valence of the alkaline earth metals (group IIA) is plus two, since these have two valence electrons.

The following table gives the normal (most usual) valence of the normal elements (see periodic chart), and, also, whether the valence electrons are given or accepted.

TABLE 5

Number of group valence electrons	Valence	Number of electrons given or accepted
IA-1.....	Plus 1.....	1 given.
IIA-2.....	Plus 2.....	2 given.
IIIA-3.....	Plus 3.....	3 given.
IVA-4.....	{ Plus —.....	} 4 given or accepted.
	{ Minus 4.....	
VA-5.....	Minus 3.....	3 accepted.
VIA-6.....	Minus 2.....	2 accepted.
VIIA-7.....	Minus 1.....	1 accepted.
VIIIA-8.....	0.....	None given or accepted.

The transitional elements usually have 2 or more valence states, since the orbit next to the valence orbit will contribute electrons to the valence of the element.

For example.—Mercury has two valence states: (Plus 1 called mercurous) and (plus 2 called mercuric).

Symbols

In the same convenient way that mathematics uses a system of symbols: 1, 2, 3, for the numbers one, two, three, etc., chemistry has developed around the use of symbols for the chemical elements. Without the use of symbols, written chemistry would be cumbersome and tedious.

The symbol for a chemical element is usually the first letter in the name of that element. To avoid confusion another key letter in the name is also used. Usually this is the second letter.

For example, since C is the symbol for carbon, the symbol Co was assigned to cobalt, in order that the two might not become confused.

Many of the elements were discovered in the days when Latin was the language of science. Their symbols were therefore derived from their Latin names. For example: *Natrium* was the Latin name for sodium. Thence the symbol Na. *Plumbum* was the name for lead. Therefore, the symbol Pb was assigned. *Ferrum*, the Latin for iron, gives rise to the symbol Fe. Tungsten, symbol W, has become the official name for the element that was called *Wolfram*.

TABLE 6.—Common Valence Numbers

	Monovalent	Divalent	Trivalent
Metals	Sodium..... Na ⁺	Calcium..... Ca ⁺⁺	Aluminum..... Al ⁺⁺⁺
	Potassium... K ⁺	Copper (ic).... Cu ⁺⁺	Iron (ferric).... Fe ⁺⁺⁺
	Ammonium... NH ₄ ⁺	Magnesium.... Mg ⁺⁺	Chromium..... Cr ⁺⁺⁺
	Silver..... Ag ⁺	Mercuric..... Hg ⁺⁺	Arsenic..... As ⁺⁺⁺
	Mercurous... Hg ⁺ or Hg ₂ ⁺⁺	Iron (ferrous) .. Fe ⁺⁺	Antimony..... Sb ⁺⁺⁺
		Lead..... Pb ⁺⁺	
Nonmetals		Zinc..... Zn ⁺⁺	
	Chlorine.... Cl ⁻	Oxygen..... O ^{- -}	Nitrogen..... N ^{- - -}
	Bromine.... Br ⁻	Sulfur..... S ^{- -}	Phosphorus.... P ^{- - -}
	Iodine..... I ⁻		
Radicals	Fluorine.... F ⁻		
	Hydroxide... OH ⁻	Carbonate.... CO ₃ ^{- -}	Phosphate... PO ₄ ^{- - -}
	Nitrate..... NO ₃ ⁻	Sulfate..... SO ₄ ^{- -}	Arsenate..... AsO ₄ ^{- - -}
	Chlorate.... ClO ₃ ⁻	Sulfite..... SO ₃ ^{- -}	
	Bicarbonate. HCO ₃ ⁻		

Formula

Since compounds are formed of elements the composition of a compound may be expressed by grouping together the symbols of its component elements. For example: table salt is composed from sodium and chlorine in an atom for atom ratio. The formula is then simply NaCl. The formula for quick lime, calcium oxide, is CaO.

When there is more than one atom of a particular element in a single molecule of a compound, a number is placed at the lower right of the symbol, designating the number of atoms of that element in each molecule. For example, H_2SO_4 is the formula for sulfuric acid. The formula tells us that each molecule of sulfuric acid contains 2 atoms of hydrogen, 1 atom of sulfur, and 4 atoms of oxygen. H_2O indicates that in each molecule of water there are 2 atoms of hydrogen and 1 atom of oxygen. Sugar has the formula $\text{C}_{12}\text{H}_{22}\text{O}_{11}$.

The usual formula for inorganic compounds expresses the simplest ratio of elements in the compound. This is called the empirical formula.

Sometimes the simplest formula does not give a true picture of the molecule. Then it is necessary to modify the formula to fit the situation. This is usually done by using a "molecular" formula. This formula expresses the actual numbers of atoms that occur in the molecule. For example, calomel, or mercurous chloride, has the empirical formula HgCl . However, each molecule contains two atoms of mercury and two atoms of chlorine. Therefore, the molecular formula becomes Hg_2Cl_2 . (Other examples: Hydrogen, H_2 ; Oxygen, O_2 ; Chlorine, Cl_2 ; Iodine, I_2 ; Nitrogen, N_2 ; Phosphorous, P_4 .)

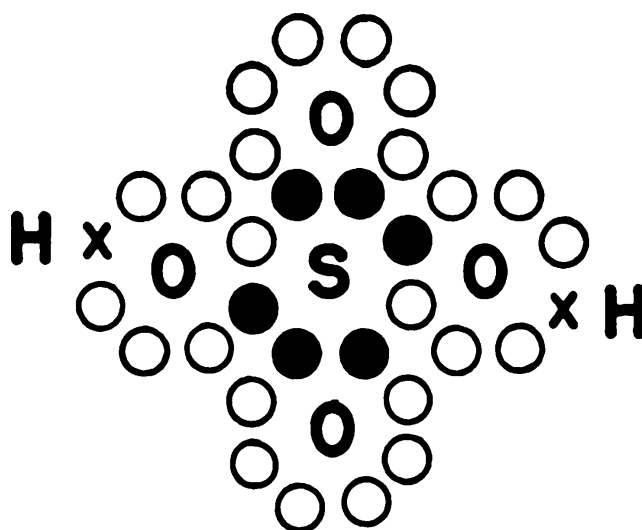
Radicals

When certain compounds, such as sulfuric acid (H_2SO_4) and potassium cyanide ($\text{K}(\text{CN})$), undergo chemical changes, some of their atoms remain grouped together. These groups, called radicals, are more or less resistant to change. Since radicals tend to retain their characteristics and are generally removed from their compounds as a unit, it is convenient to

write them as a unit in writing formulas. This is done by including the radicals in parentheses (e. g.).

Calcium hydroxide.....	$\text{Ca}(\text{OH})_2$ or CaO_2H_2
Aluminum sulfate.....	$\text{Al}_2(\text{SO}_4)_3$ or $\text{Al}_2\text{S}_3\text{O}_{12}$
Ammonium sulfide.....	$(\text{NH}_4)_2\text{S}$ or $\text{N}_2\text{H}_8\text{S}$
Potassium ferrocyanide.....	$\text{K}_4(\text{Fe}(\text{CN})_6)$ or $\text{K}_4\text{FeC}_6\text{N}_6$

The subscript number indicates the number of times the radical occurs in one molecule of the substance. In any compound the valences of all the atoms must be satisfied; therefore, it is sometimes necessary to use the "electronic" formula. This type of formula very nearly shows the actual structure of the molecule (e. g.).



- = The valence electrons of oxygen
- × = The valence electrons of hydrogen
- = The valence electrons of sulfur

Figure 5.—The electron structure of sulfuric acid.

Molecular Weights

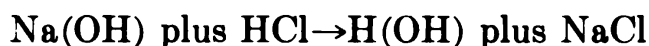
Since each element has a definite atomic weight, and a formula shows the number and kind of atoms present, it

follows that the "molecular" or formula weight can be deduced from the formula; e. g., sodium bicarbonate has the formula NaHCO_3 .

<i>Element</i>	<i>Atomic weight</i>	<i>Number of atoms</i>			<i>Weight of element in compound</i>
Na.....	22. 997	×	1	=	22. 997
H.....	1. 008	×	1	=	1. 008
C.....	12. 010	×	1	=	12. 010
O.....	16. 000	×	3	=	48. 000
Molecular weight of NaHCO_3					= 84. 015

Equations

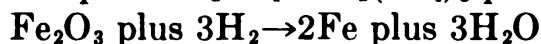
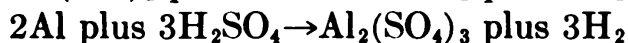
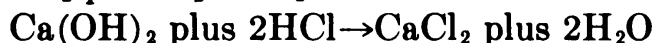
By the use of formulas it is possible to indicate precisely what happens in a chemical reaction. What happens when sodium hydroxide, lye, (NaOH) is added to hydrochloric acid (HCl)? Water (H_2O) and Salt (NaCl) are formed chemically.



This is called an equation.

Notice that the number of atoms of each element to the left of the arrow is equal to the number of atoms of the same element to the right of the arrow. This is essential!! If one molecule of a substance reacts with other than one molecule of another substance, it is necessary to adjust this by "balancing the equation." This is done by placing a whole number in front of each formula, indicating the relative number of molecules involved.

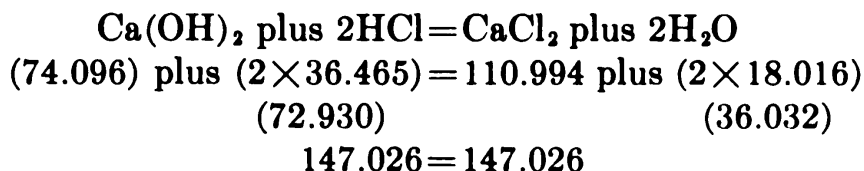
Examples:



In most cases, if the formulas are known, the equation may be balanced quickly by trial and error. With a little practice, you should have no difficulty in balancing equations.

In a balanced equation the sum of the weights of all the

substances on one side of the arrow is equal to the sum of the weights of all the substances on the other side.



Acids, Bases, Salts

Acids are compounds of hydrogen. When they are in water solution, they will change the color of litmus from blue to red. They have a sour taste. The hydrogen of an acid is easily replaced by an active metal such as zinc.

Many compounds of hydrogen are not acids. In these compounds, the hydrogen is more tightly bound; e. g., NH_3 , NaOH , CH_4 . Acids may be classified according to the number of hydrogen "ions" (protons) furnished by each molecule.

Monobasic, 1 proton

Dibasic, 2 protons

Tribasic, 3 protons

TABLE 7.—Some Common Acids Classified

Monobasic	Dibasic	Tribasic
HCl (hydrochloric acid).	H_2SO_4 (sulfuric acid).	H_3PO_4 (phosphoric acid).
HBr (hydrobromic acid).	H_2CO_3 (carbonic acid).	H_3BO_3 (boric acid).
HNO_2 (nitrous acid).		
HNO_3 (nitric acid).		
$\text{H}(\text{C}_2\text{H}_3\text{O}_2)$ (acetic acid).		

Bases are compounds which will react with acids to form salts. In water solution they turn red litmus blue. They have a bitter taste and a soapy feel. Ordinarily, they contain the hydroxyl radical (OH) attached to a metal which is readily replaced. According to modern concepts, a base is

any substance which will accept a proton. They can be classified according to the number of protons they will accept. That is, monoacid, diacid, and triacid, depending upon whether they accept one, two, or three protons respectively.

TABLE 8.—Some Common Bases Classified

Monoacid	Diacid	Triacid
KOH (potassium hydroxide).	Ca(OH) ₂ (calcium hydroxide).	Al(OH) ₃ (aluminum hydroxide).
NaOH (sodium hydroxide).	Mg(OH) ₂ (magnesium hydroxide).	
NH ₄ OH (ammonium hydroxide).		

The classes of acids and bases are more readily understood when the student considers that one molecule of a diacid base will react with two molecules of a monobasic acid. (Ca(OH)₂ plus 2HCl→CaCl₂ plus H₂O), or that one molecule of a tribasic acid will combine with three molecules of a monoacid base (H₃PO₄ plus 3NaOH→Na₃PO₄ plus 3H₂O).

Relations between acids and bases.—In some acids the protons are more readily given up than in others. The strength of an acid depends on the ease with which this occurs. A strong acid gives up its protons readily. A weak acid does so with difficulty. Conversely, a strong base readily accepts a proton while a weak base does not.

Salts are the products of the reaction of an acid and a base. They generally contain a metal, or the ammonium radical, and an acid radical, such as phosphate, chloride, or sulphate.



They are classified according to their composition. Normal salts contain neither replaceable hydrogens nor replaceable hydroxyl groups. Example.—NaCl, K₂SO₄. Acid salts contain a replaceable hydrogen. Examples.—NaHCO₃, Na₂HPO₄. Basic salts contain a replaceable hydroxyl. Examples.—Ca(OH)Cl, Bi(OH)NO₃.

TABLE 9.—Relative Strength of Some Common Acids and Bases

Bases		Acids
NaOH..... KOH.....	Strong.....	HCl. H ₂ SO ₄ . HNO ₃ .
Ca(OH)..... Mg(OH) ₂	Moderate.....	H ₃ PO ₄ . HNO ₂ .
NH ₄ OH..... Zn(OH) ₂	Weak.....	HCN. H(C ₂ H ₃ O ₂).
H ₂ O..... NaCl.....	Neutral.....	H ₂ O. NaCl.

Nomenclature

The naming of compounds follows a definite system. Since compounds are composed of elements, which may be in the form of radicals, the system revolves around the naming of the various parts of the compounds. Drawing an arbitrary line, we can separate these parts into two classes—metallic and nonmetallic. The metallic is named first and the nonmetallic is named second.

The metallic portion is generally an elemental metal. The only common exception is the ammonium (NH₄) radical. If only one valence state exists, the metallic portion receives the name of the metal. (Sodium; Calcium; Magnesium). When more than one valence state exists, compounds of the lower valence state are designated by the ending “ous” on the name of the metal. The ending “ic” is used to indicate the higher of the valence states.

Element	Lower valence	Higher valence
Iron.....	Ferrous hydroxide Fe(OH) ₂ ..	Ferric hydroxide Fe(OH) ₃ .
Mercury---	Mercurous chloride HgCl ₂ ---	Mercuric chloride HgCl ₂ .
Tin.....	Stannous chloride SnCl ₂ ----	Stannic chloride SnCl ₄ .

The nonmetallic portion of the molecule is generally named according to the acid from which it is derived. Acids are divided into binary and ternary acids, depending on whether they have two or three different elements. Binary acids are named by using the prefix "hydro" plus the ending, "ic." For example.—hydro chlor ic is the name of the binary acid of chlorine (HCl). The name of the binary acid of sulfur (H₂S) would then be hydro sulfur ic. The ternary acids are named according to the amount of oxygen they contain. If the acid contains as much oxygen as it normally can, it is named with the ending "ic." If the acid contains one less atom of oxygen than the normal, the name receives the ending "ous." If it contains two less atoms of oxygen than normal, the prefix "hypo" is used in addition to the ending "ous." When there is one oxygen more than normal, the prefix "per" is used in addition to the ending "ic."

The following table illustrates the naming of the acids (and salts):

TABLE 10

Formula of acid	Name of acid	Formula of corresponding sodium salt	Name of salt
<i>Binary acids</i>			
HCl.....	Hydro chlor ic.....	NaCl.....	Sodium chlor ide.
HBr.....	Hydro brom ic.....	NaBr.....	Sodium brom ide.
H ₂ S.....	Hydro sulfur ic.....	Na ₂ S.....	Sodium sulf ide.
<i>Ternary acids</i>			
HClO.....	Hypo chlor ous.....	NaClO.....	Sodium hypo chlor ite.
HClO ₂	— Chlor ous.....	NaClO ₂	Sodium — chlor ite.
HClO ₃	— Chlor ic.....	NaClO ₃	Sodium — chlor ate.
HClO ₄	Per chlor ic.....	NaClO ₄	Sodium per chlor ate.
H ₂ SO ₄	Sulfur ic (common).....	Na ₂ SO ₄	Sodium sulf ate.
H ₂ SO ₃	Sulfur ous.....	Na ₂ SO ₃	Sodium sulf ite.
H ₂ S ₂ O ₇	Per sulfur ic.....	Na ₂ S ₂ O ₇	Sodium per sulf ate.
H ₂ N ₂ O ₄	Hypo nitr ous.....	Na ₂ N ₂ O ₄	Sodium hypo nitr ite.
HNO ₂	Nitr ous.....	NaNO ₂	Sodium nitr ite.
HNO ₃	Nitr ic (common).....	NaNO ₃	Sodium nitr ate.

The salts are then named from the acids by substituting "ite" endings for the "ous" in the name of the ternary acid and "ate" for the "ic" in ternary acids.

The "ic" ending in binary acids is substituted by "ide" in the naming of their salts.

In compounds such as mixed salts, double salts, and complex compounds, each of the elements and radicals is named. The metallic constituents first and the nonmetallic last. For example:

NaK(SO ₄).....	Sodium potassium sulfate.
Mg(NH ₄) (PO ₄).....	Magnesium ammonium phosphate.
KAl(SO ₄) ₂	Potassium aluminum sulfate.
NaH(SO ₃).....	Sodium hydrogen sulfite or sodium acid sulfite.
Ca(OH)Cl.....	Calcium hydroxy chloride or calcium basic chloride.
K ₂ HgI ₄	Potassium mercuric iodide.
K ₄ (Fe(CN) ₆).....	Potassium ferro cyanide.

In the case of acid salts, the designation "bi" or "acid" is commonly used. For example:

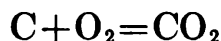
NaHCO ₃	Sodium bicarbonate or sodium acid carbonate.
NaH(SO ₃).....	Sodium bisulfite or sodium acid sulfite.

Some compounds are neither acids, bases, nor salts. By and large, these are binary compounds and are named according to the system for the salts of binary acids; e. g., calcium oxide (CaO); magnesium nitride (Mg₃N₂); calcium carbide (CaC₂).

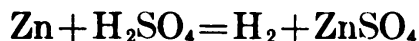
Reactions

Chemical reactions are divided into four general classes.

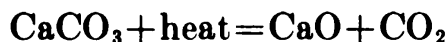
1. *Combination reactions* occur when two substances combine to form one substance.



2. *Displacement reactions*.—In these, one element displaces another element from a compound.

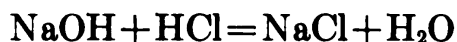


3. *Decomposition reactions* are characterized by decomposition of one substance to form two or more substances.

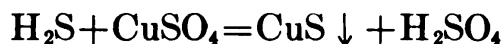
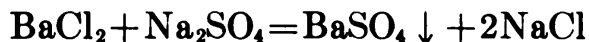


4. *Double decomposition reactions* are, by far, the most commonly encountered chemical reactions. They involve the inter-action of two or more substances to form two or more new substances. This class may be subdivided into many subgroups. The three most common are:

The **acid-base system** in which an acid reacts with a base to give salt and water. This system as it occurs in blood is essential to life.



The **precipitation reactions** in which two soluble substances react to form one or more insoluble products. Usually, the insoluble products in the reaction are indicated with an arrow pointing downward. This is the system involved in the formation of kidney stones.



The oxidation-reduction system.—These reactions make possible the conversion of food to energy in the body. It is perhaps a little more complex than the other types of reactions. This is because it involves a change in valence state. Oxidation and reduction always occur simultaneously. In other words, when one substance is oxidized, another is reduced. An increase in the valence state of an atom shows this atom to have been oxidized.

Relation of various oxidation states of sulfur.

Compound:	SO_3	SO_2	S	H_2S
Valence State:	S^{6+}	S^{4+}	S^0	$\text{S}=-$

Oxidation

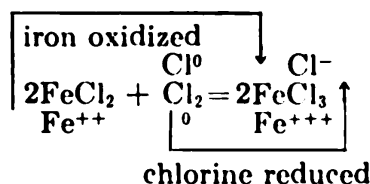
←

Reduction

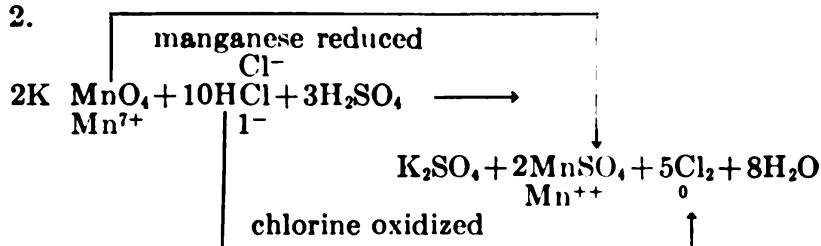
→

Conversely, a decrease in valence number indicates reduction.

1.



2.



In the above reactions the valence of chlorine changes from minus one to zero, an increase. Therefore, chlorine is oxidized. The valence of manganese changes from plus seven to plus two, a decrease. Therefore, manganese, the substance reduced, is the oxidizing agent.

Percentage composition.—The percent of an element in a compound can be calculated from the formula of the compound.

The percentage composition of a substance can be obtained as follows: (1) Find the molecular weight of the substance; (2) divide the atomic weight of each element (or its multiple) by the molecular weight; (3) multiply each quotient by 100 to give the percentage.

Problem: Find the percentage composition of Na_2HPO_4

Solution: $2\text{Na} + \text{H} + \text{P} + 4(4 \times 16)0 = 142$

$$(2 \times 23) \quad 1 \quad 31 \quad 64$$

$$\text{Percent Na} = \frac{2 \times 23}{142} \times 100 \cong 32.4 \text{ percent}$$

$$\text{Percent H} = \frac{1}{142} \times 100 \cong 0.71 \text{ percent}$$

$$\text{Percent P} = \frac{31}{142} \times 100 \cong 21.82 \text{ percent}$$

$$\text{Percent O} = \frac{4 \times 16}{142} \times 100 \cong 45.07 \text{ percent}$$

$$\text{Total} = 100.00 \text{ percent}$$

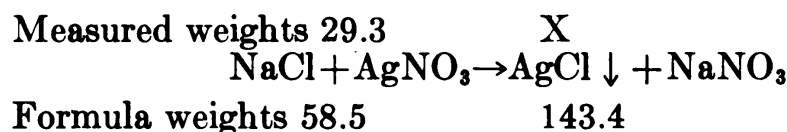
It follows, then, that if the weight of a compound is known, the weight of any of the elements it contains may be readily calculated.

Problem.—Find the number of grams of sodium in 30 grams of sodium chloride.

$$\frac{\text{Na}}{\text{NaCl}} = \frac{22.997}{58.454} = 0.3934 \times 100 = 39.34 \text{ percent}$$

Sodium chloride contains 39.34 percent sodium: 39.34 percent of 30 grams = 11.802 grams of sodium in 30 grams of sodium chloride.

Since in a chemical reaction the law of conservation of mass is implied, it is possible to calculate the weights of the substances involved. For example.—It is possible to calculate the weight of silver chloride which can be produced from a known weight of sodium chloride and vice versa. Problem.—How many grams of silver chloride can be produced from 29.3 grams of sodium chloride according to the following reaction?



This problem is solved by ratio and proportion, according to the general rule that the ratios of the weights of the substances are proportional.

$$\frac{29.3}{58.5} = \frac{X}{143.4}$$

where

X = weight of silver chloride produced.
 29.3 = weight of NaCl.
 58.5 = molecular weight of NaCl.
 143.1 = molecular weight of AgCl.

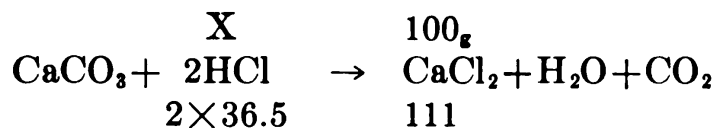
Solving for X

$$X = \frac{29.3 \times 143.4}{58.5} = \frac{4201.62}{58.5} = 71.8 \text{ grams}$$

The steps to follow in the solution of a problem of this type are:

1. Write the balanced equation for the reaction involved.
2. Calculate the molecular weights of the substances involved. Write the molecular weights under the corresponding formulas.
3. Multiply the molecular weight by the number of times the substance occurs (e. g., $2\text{NaCl}=2\times 58.5=117.0$).
4. Write the measured weight of the known substance above its formula.
5. Place an X above the formula of the substance whose weight is to be found.
6. Set up the ratio and proportion. Solve for X.

Problem.—How many grams of HCl are necessary to make 100 grams of calcium chloride from calcium carbonate?



$$2\times \frac{\text{X}}{36.5} = \frac{100}{111} \text{ OR } \frac{\text{X}}{73.0} = \frac{100}{111}$$

$$\text{X} = 65.77 \text{ grams of HCl}$$

Study the section on solutions and concentration before attempting these calculations.

In dealing with solutions, a solution with an even concentration is seldom encountered. To calculate molarities, it is necessary to know first the number of moles in one liter of solution. The number of moles of any substance is equal to the weight of the substance divided by the molecular weight.

$$\frac{\text{weight}}{\text{molecular weight}} = \text{moles (number of gram molecular weights)}$$

Example.—500 cc. of a solution contains 30 grams of HCl. What is the concentration expressed as molarity?

$$\frac{500}{30} = \frac{1,000}{X}$$

$X = 60$ grams of HCl in one liter of solution

$$\frac{60}{36.5} = \text{moles per liter of solution}$$

This solution is, then, 1.642 M HCl.

Normalities of solutions are calculated in exactly the same fashion except that the gram equivalent weight is used wherever the gram molecular weight is used in solving for molarities.

Example.—How many grams of H_2SO_4 are necessary to form a liter of 1.5N H_2SO_4 ?

$$\frac{\text{weight}}{\text{equivalent weight}} = \text{number of chemical equivalents}$$

equivalent weight of H_2SO_4

$$= \frac{\text{molecular weight of } \text{H}_2\text{SO}_4}{2} = \frac{98}{2} = 49$$

$$\frac{X}{49} = 1.5$$

$$X = 1.5 \times 49$$

$$X = 73.5 \text{ grams } \text{H}_2\text{SO}_4$$

Solutions

Solutions are homogenous mixtures of substances. All solutions consist of two parts: The solvent or substances in which another substance dissolves, and the solute or substance which dissolves in the solvent. Usually the constituent present in the greatest proportion is called the solvent. In a true solution, the particles of the solute are of molecular size.

There are three types of solutions, classified according to their physical state:

1. *Gaseous solutions.*—Gases mix with one another in all proportions to form homogenous mixtures, which may be called solutions.

Example.—Dry air is a solution containing about 78 percent nitrogen and 21 percent oxygen, the other 1 percent

consisting of carbon dioxide, and the rare gases, helium, neon, argon, etc.

2. *Liquid solutions*.—Gases, liquids, and solids dissolved in liquid solvents are called liquid solutions.

Example.—Pure HCl is a gas which dissolves readily in water to form an aqueous solution of hydrochloric acid. Oils form liquid solutions in chloroform. Salts, sugars, and bases dissolved in water are also liquid solutions.

3. *Solid solutions*.—In these solutions, gases, liquids and solids are dissolved in solids.

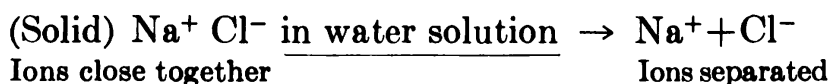
Example.—Hydrogen dissolves in solid palladium. Certain alloys are solid solutions of one metal in another.

Electrolytes and nonelectrolytes, and ionization.—Solute may be classified according to whether their water solutions will conduct electricity. Acids, bases, and salts are called electrolytes because their solutions conduct electricity. The reason they do is that they separate into electrically charged particles called ions when they are dissolved by water.



It is the ions, moving freely in the solution, that allow the electricity to flow.

This phenomenon was called ionization. Actually a more proper term is “the dissociation of ionic compounds.” According to modern theories (the Debye-Hückle Theory), electrolytes are completely ionized in the pure state, but the oppositely charged ions are held in close association by their electrostatic charges. The solution of ionic compounds (electrolytes) in water merely allows the ions a greater degree of freedom.



Solubility (the degree to which a solute will dissolve in a given solvent).—It is a commonly observed fact that some substances will dissolve in one solvent but will fail to dissolve

in another while others will dissolve in the second solvent but not in the first. Also, that the solubility of a solute in a given solvent varies with the physical conditions imposed on the system. These problems have been carefully studied from the beginning of chemical science and many of the knots have been unravelled, but the final answers have not yet been found. Some useful rules, however, have been developed.

Compounds of similar composition tend to be mutually soluble. For example.—Acids, bases and salts are ionically bound and are more or less soluble in water which is also of a polar (ionic) character. These compounds are not particularly soluble in gasoline, which is not a polar compound. On the other hand, fats and oils, which are nonpolar, are not soluble in water but are soluble in gasoline.

Compounds which react chemically with one another tend to be mutually soluble. This is shown by the fact that acids dissolve in bases, and vice versa.

Increasing the temperature of the solution generally increases the solubility of the solute. It is well known that more sugar will dissolve in hot water than cold. The exception to this rule is where the solute is a gas. The solubility then decreases with an increase in temperature. An increase in pressure aids the solution of a gas in a liquid or solid but has little or no effect on the solubility of a solid or liquid in a liquid.

All gases are completely soluble in one another.

Concentration and the measures of concentration.—The problem of how best to express the concentration of a solution is complicated by the many ways that solutions are used.

The term “dilute” and “concentrated” have little meaning except as applied to specific solutions. The only general interpretation is that the concentrated solution of a given substance contains more than a dilute solution of the same substance.

A common measure of concentration is the percent (%) composition or grams of solute per 100 grams of solution.

Sometimes the designation % W/V is encountered which means the grams of solute in 100 cubic centimeters of solution.

It is sometimes convenient, as in dealing with the concentration of body fluids, to use the term milligrams percent (mg. %). This indicates the number of milligrams of solute in 100 grams of solution.

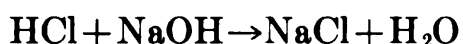
In dealing with chemical compounds, knowing the number of molecules involved is frequently more convenient than knowing the actual weights involved. Therefore, a measure of concentration called molarity (M) is used. By definition a molar (1 M) solution is one which contains 1 mole (G. M. W., gram-molecular weight, or the number of grams of the substance equal to the molecular weight of that substance) of solute in each liter of solution. For example:

1 M HCl contains 1 mole or 36.465 gm. of HCl in 1 liter of solution.

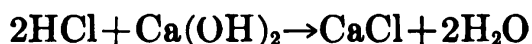
2 M NaCl contains 2 moles or 116.908 gm. of NaCl in 1 liter of solution.

0.2 M NaCl contains 0.2 moles or 11.6908 gm. of NaCl in 1 liter of solution.

Sometimes, especially in analytical work where there are unknown factors involved, it is useful to work with solutions with concentrations expressed in terms of chemical equivalence. For example in the reaction:



1 mole of HCl is equivalent to 1 mole of NaOH, but in the reaction:



1 mole of HCl is equivalent to only $\frac{1}{2}$ mole of $\text{Ca}(\text{OH})_2$.

The measure of concentration designating chemical equivalence is normality. A normal solution (1N) is one which contains 1 gram equivalent weight (G. E. W. or equivalent) of solute in one liter of solution. The actual weight of one equivalent depends on the type of reaction involved.

In the reactions of acids with bases, the equivalent weight

of an acid is equal to the molecular weight of the acid divided by the number of replaceable hydrogens in 1 molecule of the acid. E. g., the equivalent weight of

$$\text{H}_2\text{SO}_4 = \frac{98.082}{2} = 49.041 \text{ grams.}$$

The equivalent weight of a base is equal to the molecular weight of the base divided by the number of replaceable hydroxide ions ($-\text{OH}-$) in the base. E. g., the equivalent weight of

$$\text{Al}(\text{OH})_3 = \frac{91.194}{3} = 30.368 \text{ grams.}$$

The term "saturated" often appears in connection with solutions. The best definition of this term is as follows: A solution is saturated at a given temperature and pressure if the addition of more solute fails to alter the concentration.

The concentration of an unsaturated solution will increase upon addition of more solute. On the other hand, the excess solute in a supersaturated solution will precipitate on adding more of the undissolved solute, thus decreasing the concentration of the original solution.

ORGANIC CHEMISTRY

Organic chemistry is the chemistry of carbon compounds; these compounds were originally obtained only as products of organized life, i. e., plants and animals. As late as 1828, it was generally believed that a vital force was necessary to produce organic compounds from the elements. It was in that year that Wohler, a German chemist, prepared urea, unquestionably an organic compound, from purely inorganic reagents.

Today, a sparkling array of organic compounds are prepared synthetically. Every year hundreds more yield to the persistent attacks of research. In March of 1952, morphine, after more than 125 years of intensive research, was completely synthesized for the first time.

There are still many organic compounds which for practical or technical reasons are still prepared from living sources. Notable among these are drugs such as morphine, penicillin, or aureomycin and foods such as sugar, fats, and oils. Petroleum serves as a source of materials for the preparation of a great number of things which we use daily such as plastics, fabrics, paints, dyes, fuels, and foods.

The simple fact that carbon atoms can be linked together to form long chains, branches, and rings makes possible an almost infinite number of compounds having an equivalent number of properties.

Isomerism.—In the study of inorganic compounds the use of empirical or molecular formulas is generally quite sufficient. However, even molecular formulas do not always describe an organic compound. Take for example, C_2H_6O . This formula describes two compounds, di methyl ether and ethyl alcohol. The ether is a dangerously toxic gas while the alcohol is a narcotic liquid. This phenomenon is called isomerism. Isomers are compounds having the same molecular formula but different properties.

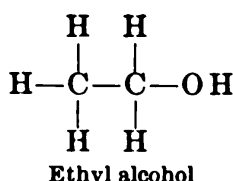
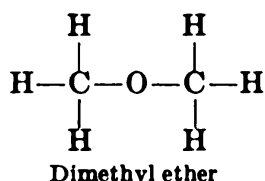
Structural formulas.—The properties of organic compounds do not depend so much on the kinds of elements comprising them as they do on the way in which these elements are linked together. In the same way boats, houses, furniture, and phone poles are all made of wood but serve different purposes. Structure, then, is the key to organic chemistry.

First the student should understand that these compounds are three dimensional and that the formulas on paper merely represent the compounds and are not life images of them.

In the vast majority of cases the valence of carbon is four, oxygen is two, and hydrogen is one. In writing a structural formula, the student should always check to make sure the valence of all atoms is properly satisfied.

The following examples show the usefulness of structural formulas in describing isomers.

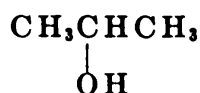
Graphic structural formulas:



Modified structural formulas:



Normal propyl alcohol



Isopropyl alcohol

Homologous Series

In the study of any chemistry it is convenient to group similar compounds together. In organic chemistry these groups or families are called Homologous Series.

Members of an homologous series have the same general formula, similar chemical properties and differ from each other by one or more methylene ($-\text{CH}_2-$) groups.

The Alkanes.—(Saturated or Paraffin Hydrocarbons).—Since the naming of many series of organic compounds is based on this group, it will be studied first. These are compounds containing only hydrogen and carbon. They fit the general formula $\text{C}_n\text{H}_{2n+2}$, where n is the number of

TABLE 11

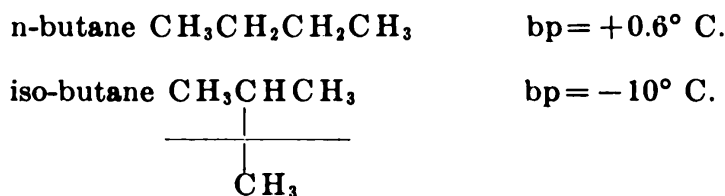
Name	Molecular formula	Number of isomers	Boiling point of normal isomer
			<i>Degrees centigrade</i>
Methane.....	CH_4	1	— 161
Ethane.....	C_2H_6	1	— 88
Propane.....	C_3H_8	1	— 45
Butane.....	C_4H_{10}	2	0. 6
Pentane.....	C_5H_{12}	3	36
Hexane.....	C_6H_{14}	5	69
Heptane.....	C_7H_{16}	9	98
Octane.....	C_8H_{18}	18	126
Nonane.....	C_9H_{20}	35	150
Decane.....	$\text{C}_{10}\text{H}_{22}$	75	174

carbons in the compound. Practically all of them occur naturally in petroleum.

The simplest possible compound conforming to this general formula is methane (CH_4). Table 11 lists the first ten members of the series with the calculated number of isomers and the boiling points of the normal (unbranched) isomers.

A look at the boiling points listed in table 11 shows the effect of increasing the length of the carbon chain on the boiling point. Other properties are modified in a similar predictable fashion.

Isomerism also affects the properties. As an example, take the isomeric butanes.



The "alkyl" radicals or hydrocarbon groups that branch from the principal chain of carbons derive their names from the corresponding alkanes. They are designated by substituting the ending, "yl" for the "-ane" of the alkane from which they are derived.

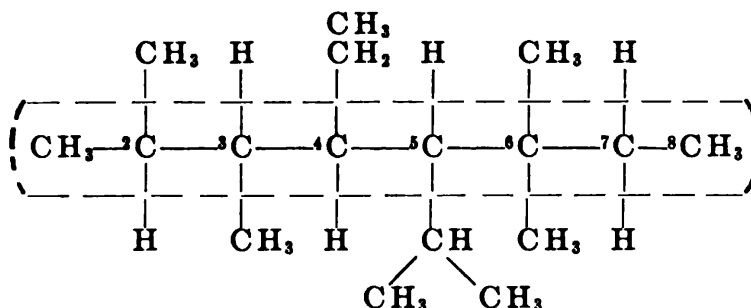
Common alkyl radicals

- CH_3 —methyl.
- CH_3CH_2 —ethyl.
- $\text{CH}_3\text{CH}_2\text{CH}_2$ —n-propyl.
- CH_3CH —iso propyl.
 $\begin{array}{c} | \\ \text{CH}_3 \end{array}$
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2$ —n-butyl.
- $\text{CH}_3\text{CH}_2\text{CHCH}_3$ —sec-butyl.
- CH_3CHCH_2 —iso-butyl.
 $\begin{array}{c} | \\ \text{CH}_3 \end{array}$
- CH_3CCH_3 —tert-butyl.
 $\begin{array}{c} | \\ \text{CH}_3 \end{array}$
- $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2$ —n-amyl.

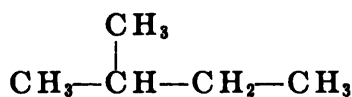
In 1922, the International Union of Chemistry met to reform the nomenclature of organic compounds. The

I. U. C. system was the result of their efforts and is the system now generally accepted.

According to this system, compounds are named as derivatives of the longest continuous chain of carbons. The carbons are numbered consecutively from one end of the chain to the other. The position of each substituting group is designated by the number of the carbon to which it is attached.



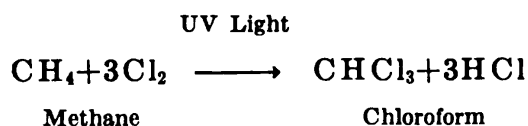
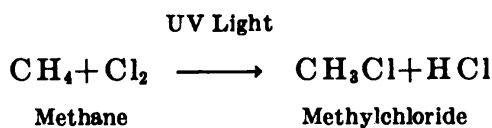
2, 3, 6, 6, tetramethyl-4, ethyl-5 iso propyl octane



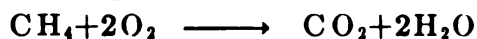
2-methyl butane

Petroleum serves as a source of a great many alkanes. They are separated by a process known as fractional distillation. This process is based on the fact that compounds having different boiling points may be separated by controlling the temperature so that the lower boiling compounds will escape as gases and the higher boiling compounds remain behind, the gases being caught and condensed.

The alkanes, as a group, are relatively unreactive. They will react with the halogens such as chlorine only if the reaction is catalysed by ultraviolet light.



They will react with oxygen in air to form carbon dioxide and water. For example:



This is the type of reaction that occurs in the burning of gasoline.

Carbohydrates.—These are the sugars, starches and wood-fibers which comprise such an essential part in our daily lives. Due to the brilliant fundamental researches of Emil Fischer, the chemistry of at least the simpler compounds is fairly well understood.

They are classified into three general groups, depending on their reaction to hydrolytic agents.

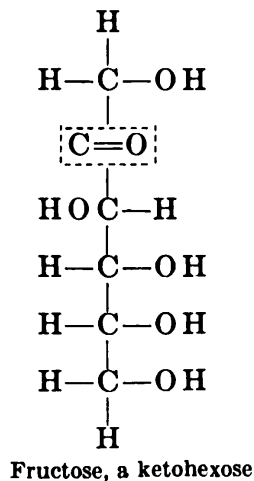
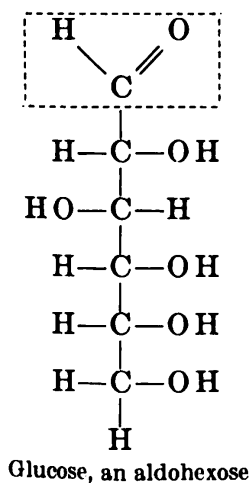
a. *Mono-saccharides.*—The simplest sugars do not hydrolyse (glucose, fructose, galactose, etc.).

b. *Di-saccharides.*—Yield two mono-saccharides on hydrolysis (sucrose, lactose, maltose, etc.).

c. *Poly-saccharides.*—Yield many sugars on hydrolysis (starch, glycogen, cellulose, etc.).

The mono- and di-saccharides are sweet, crystalline, water soluble substances called sugars. The poly-saccharides are more or less tasteless, noncrystalline and are generally insoluble in water.

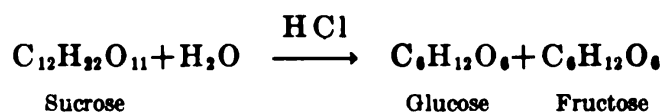
Mono-saccharides.—The most common mono-saccharides contain 6 carbons. They are called hexoses. Analysis indicates that hexoses contain 5 alcohol groups and either one aldehyde or one ketone group. If a hexose contains an aldehyde group, it is called an aldohexose. If it contains a ketone group it is called a ketohexose.



The exact spatial arrangement of the atoms is important since it involves a special kind of isomerism called optical isomerism. There are 16 possible optical isomers that are aldohexoses.

Di-saccharides.—There are two types of di-saccharides, depending on their ability to reduce (and be oxidized by) Fehling's solution (this is a readily reduced blue solution of copper⁺⁺. The formation of a reddish brown precipitate of copper⁺ indicates reduction). All mono-saccharides will reduce Fehling's solution.

Sucrose, cane sugar, is a nonreducing di-saccharide which yields glucose and fructose on hydrolysis.



Lactose, milk sugar, is a reducing di-saccharide which on hydrolysis produces glucose and galactose, both aldohexoses.

Poly-saccharides.—These are built up of long chains of di-saccharides. They are classified according to the size of their molecules, their hydrolysis products, and their behavior toward specific hydrolytic enzymes. For example, ptyalin, an enzyme found in saliva, will hydrolyse starch readily but does not cause the hydrolysis of cellulose (cotton).

The metabolism of carbohydrates.—Starches and sugars, taken orally, are hydrolyzed by the action of the enzymes and acids in the gastrointestinal tract. The mono-saccharides thus produced are absorbed through the small intestine into the blood stream. They are then transported via the portal vein to the liver which converts the glucose to glycogen (animal starch). It is stored in the liver to be released as the body demands. Some of the sugar in the blood stream is transported to the muscles for glycogen synthesis and storage as a quick source of energy. The energy is obtained by the oxidation of simple sugars to give CO₂ and water.

CYCLIC COMPOUNDS

These compounds are typified as containing ring-like groups of carbons as opposed to the open chains studied up until now. This family is subdivided according to the structure of the ring.

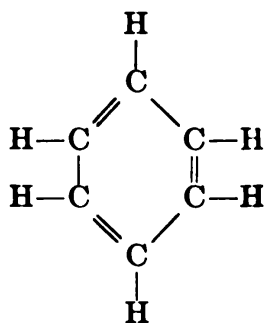
Aromatic compounds.—Ring structure similar to that of benzene, with all the atoms forming the ring being of the same element (almost always carbon); e. g., benzene, toluene, naphthalene, phenol, etc.

Alicyclic compounds.—All atoms in the ring are of the same element, but the structure is not similar to benzene; e. g., cyclopropane, camphor, menthol, etc.

Heterocyclic compounds.—The ring structure may or may not be similar to benzene, but the atoms forming the ring are not all of the same element; e. g., uric acid, heroine, the barbiturates, thiazole.

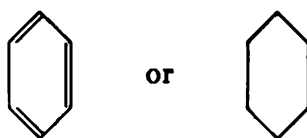
Of these subgroups, only the aromatic compounds have chemical properties sufficiently different to warrant discussion here. Although the other classes contain many compounds whose action as drugs is powerful and at times dramatic, they will be treated by simply giving some examples to illustrate their structures and relation to the other groups.

The aromatic hydrocarbons.—In the same way that methane can be considered as the fundamental aliphatic, or open-chain compound, benzene is the basis for the study of aromatic compounds. Benzene has the molecular formula C_6H_6 . The majority of evidence derived from experiment indicates that the structure must be:



Benzene

The double bonds in benzene are not static but shift between carbon pairs. This is called "resonance" and is the property essential to an aromatic compound. For the sake of simplicity, however, the above structure is seldom used in the literature, but is usually abbreviated by merely drawing a hexagon



to indicate the benzene structure. Benzene may be obtained by the distillation of coal tar or by synthesis from acetylene.

INSTRUCTION TEST

Assignment No. 3

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. The percent of an in a compound can be calculated from the formula of the
2. By use of formulas it is possible to indicate precisely what happens in a
3. Groups of symbols representing molecules are called chemical
4. A solution is one which contains one gram-molecular weight of a solute in each liter of solution.
5. Acids, bases and salts are called because their solutions conduct electricity.
6. The atoms whose atomic weights differ from that of the most common atoms of the same element are called
7. The only way in which the of an atom can vary without changing the atomic number is to vary the number of neutrons in the nucleus.
8. Since each element has a definite weight, and a formula shows the number and kind of present, it follows that the or formula weight can be deduced from the formula.
9. A normal solution is one which contains one gram equivalent weight of in one of solution.

10. The measure of concentration designating equivalence is
11. The equivalent weight of an acid is equal to the
weight of the acid divided by the number of replaceable
in one molecule of the acid.
12. Calomel, or mercurous chloride, has the empirical formula HgCl ;
however, each molecule contains two atoms of mercury and two
atoms of chlorine; therefore the molecular formula becomes
.....
13. The weight of an atom is equal to the plus the
.....
14. The atomic weight of calcium is 40.08 and of chlorine is 35.54; thus
the molecular weight of CaCl_2 is
15. To conform to the law of conservation of matter, all chemical
equations must be
16. If one molecule of a substance reacts with other than one molecule
of another substance, it is necessary to adjust this by
the equation.
17. Balancing an equation is done by placing a small whole number in
front of each, indicating the relative number of
molecules involved.
18. An increase in aids the solution of a gas in a liquid.
19. Compounds of similar composition tend to be mutually

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

20. The usual formula for inorganic compounds expresses the simplest
ratio of elements in the compound; this is called
 1. the structural formula
 2. the compound symbol
 3. the empirical formula
 4. the stereochemic formula
.....
21. Burning of hydrogen to form water is an example of
 1. decomposition reaction
 2. combination reaction
 3. displacement reaction
 4. double decomposition reaction
.....
22. The formula for the oxygen molecule is
 1. O_3
 2. O_4
 3. O
 4. O_2
.....

23. The formula for nitric acid is
1. HNO_3
 2. NH_3
 3. NA
 4. HCN -----
24. The formula for barium sulfate is
1. BS
 2. BaSO_3
 3. BaSO_4
 4. BaS -----
25. Which of the following represents a base?
1. H_2S
 2. KOH
 3. NaCl
 4. HNO_3 -----

INSTRUCTION TEST

Assignment No. 4

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. When certain -----, such as sulfuric acid and potassium cyanide undergo chemical changes, some of their atoms remain ----- together. These -----, called -----, are more or less resistant to change.
2. Chemical reactions are divided into (number) ----- general classes.
3. Decomposition reactions are characterized by decomposition of one substance to form ----- or more substances.
4. Double displacement reactions are, by far, the most commonly encountered ----- reactions. They involve the ----- of two or more substances to form two or more new substances.
5. The reaction which occurs when two substances combine to form one substance is called a ----- reaction.
6. The acid-base system is formed when acid ----- with a base to give salt and water. This system as it occurs in blood is ----- to life.
7. The precipitation reaction occurs when two ----- substances react to form one or more ----- products. This is the system involved in the formation of kidney -----.

8. The oxidation-reduction reactions make possible the of foods into in the body.
9. Acids, bases and salts separate into electrically charged particles called when they are by water.
10. When sodium hydroxide, lye (NaOH), is added to hydrochloric acid (HCl), and are formed chemically.
11. As an example, $\text{Na(OH)} + \text{HCl} \rightarrow \text{H(OH)} + \text{NaCl}$ is called a/an
12. In the balanced equation the number of of each element to the left of the arrow is equal to the number of to the right of the arrow.
13. In displacement reactions, one displaces another element from a compound.
14. Sulfuric acid has the formula H_2SO_4 and tells us that each molecule contains atom(s) of hydrogen, atom(s) of sulfur and atom(s) of oxygen.
15. Complete the following equation.
 $2\text{H}_2 + \text{O}_2 \rightarrow$
16. Complete the following equation.
 $\text{Na OH} + \text{HCl} \rightarrow$
17. Complete the following equation.
 $\text{Ca(OH)}_2 + 2\text{HCl} \rightarrow$
18. Complete the following equation.
 $\text{Zn} + \text{H}_2\text{SO}_4 \rightarrow$
19. Complete the following equation.
 $\text{Ca CO}_3 + \text{heat} \rightarrow$
20. Complete the following equation.
 $\text{H}_2\text{S} + \text{CuSO}_4 \rightarrow$
21. Complete the following equation.
 $\text{Ba Cl}_2 + \text{Na}_2\text{SO}_4 \rightarrow$
22. Complete the following equation.
 $\text{KOH} + \text{HCl} \rightarrow$
23. Complete the following equation.
 $\text{H}_3 \text{ PO}_4 + 3 \text{ Na OH} \rightarrow$
24. Complete the following equation.
 $2 \text{ Al} + 3\text{H}_2 \text{ SO}_4 \rightarrow$

INSTRUCTION TEST

Assignment No. 5

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. Organic chemistry is the study of _____ compounds; these compounds were originally obtained only as products of organized _____.
2. As late as 1828, it was generally believed that a vital force was necessary to produce organic compounds from the _____.
3. Today, a sparkling array of organic compounds are prepared _____.
4. There are still many organic compounds which for practical or technical reasons are still prepared from _____ sources.
5. The simple fact that _____ atoms can be linked together to form long chains, branches, and rings makes possible an almost infinite number of _____ having an equivalent number of properties.
6. Compounds having the same molecular formula but different properties are called _____.
7. The properties of organic compounds do not depend so much on the kinds of _____ comprising them as they do on the way in which they are _____ together.
8. The key to organic chemistry is _____.
9. In writing a structural formula, the student should always check to make sure the _____ of all the atoms is properly satisfied.
10. Members of a homologous series have the same general _____ similar _____ properties and differ from each other by one or more methylene _____.
11. The alkanes are saturated hydrocarbons containing only _____ and _____.
12. The "alkyl" radicals are designated by substituting the "_____" for the "_____" of the alkane from which they are derived.
13. The alkanes as a group are relatively unreactive. They will react with the halogens such as chlorine only if the reaction is _____ by ultraviolet lights.
14. Cyclic compounds contain _____ groups of carbons.
15. Benzene is the basis for the study of _____ compounds.
16. Benzene has the molecular formula _____.
17. Benzene may be obtained by the distillation of _____ or by synthesis from acetylenes.

18. The simplest sugars do not hydrolyse and are called
19. The poly-saccharides are more or less tasteless, noncrystalline and are generally in water.
20. Di-saccharides yield two mono-saccharides on

MATERIA MEDICA AND PHARMACOLOGY

Introduction to Materia Medica

Materia Medica is the study of drugs and dosage and their body actions.

Pharmacy is the science of preparing and dispensing medicines.

Dosage is the study of the amount of drug which is required to produce the desired therapeutic effect. Doses are classified as:

Average dose, or customary dose, as it appears in the U. S. P. or N. F. This is an average effective dose for a human adult.

Minimum dose, or the smallest amount of drug which will produce the desired effect.

Maximum dose, or the largest amount of drug which can be administered without producing toxic symptoms.

Toxic dose, or poisonous dose.

Minimum lethal dose (M. L. D.), the amount of drug just sufficient to cause death.

The dose of the drug depends upon the patient's body weight, age, sex, temperament, habits, idiosyncrasy, and occupation; the nature of the disease; the form of the drug; the method, frequency, and time of administration.

Drugs are given: orally, sublingually (under the tongue), by inhalation, by rectum, by inunction (ointment), intradermally, subcutaneously, intramuscularly (in the muscle), or intravenously (by vein).

Toxicology is the science of poisons.

A poison is a substance which, when taken into the body can produce death or serious injury.

There are two types of poisoning:

Acute.—Caused by a toxic or lethal dose or by the cumulative effects of smaller doses taken at frequent intervals.

Chronic.—Caused by small quantities of cumulative poison taken into the body over a long period.

Certain conditions modify the actions of a poison:

The physical state of the poison, whether gas, liquid, or solid.

The various channels of absorption.

The amount of poison taken.

Body weight and age.

Idiosyncrasy.

Habit.

Natural tolerance.

General health.

Time of administration.

The symptoms vary with the quantity of poison taken and absorbed and the length of time it remains in the body.

Diagnosis of poisoning is often difficult because the symptoms resemble those of certain diseases. Few poisons show symptoms sufficiently characteristic for positive identification. However, there are several aids to diagnosis.

Corrosive action produced.

Color of the stain it leaves.

Odor of the breath.

Condition of the gastrointestinal tract.

Respiration.

Pulse.

Body temperature.

Motor disturbances.

Condition of eyes, teeth, gums, and skin.

Cerebral effects.

Cardiac effects.

Color of the urine, condition of the feces and vomitus.

The treatment of poisoning involves the use of antidotes. Antidotes are any measures that will remove, prevent the

absorption of, or counteract the systemic effects of a poison. They are of three classes:

Mechanical antidote.—One which removes the poison from the stomach or a surface of the body, i. e., emetics, gastric lavage, tickling the throat to cause vomiting.

Chemical antidote.—One which chemically neutralizes the poison.

Physiological antidote.—One which counteracts the systemic effects of the poison. This type is usually given hypodermically.

The treatment of poisoning is to:

1. Remove the poison.
2. Prevent its absorption.
3. Render the poison nontoxic; counteract the systemic effects; prevent death; and eliminate the absorbed poison from the body. Poisons may be classified as:

Local poisons.—Those which cause corrosion, blistering, burning or irritation.

Systemic poisons.—Such as drugs acting on the cardiovascular system, respiratory system, and nervous system.

In the case of poisoning, save all foods, medicines, vomitus, feces, urine, or any other item that may help in determining whether the poison was taken accidentally or intentionally or was criminally administered.

The drugs in this chapter will be discussed according to their therapeutic classification. Only a brief summary will be given and the student is referred to the U. S. P., the N. F., or other standard books of reference on *Materia Medica* for a more complete study of each drug.

ACIDS

Acids are organic and inorganic. The strong acids are hydrochloric, sulfuric, nitric, nitrohydrochloric, and phosphoric. Weak acids are boric, hydriodic, hydrocyanic, and the organic acetic acids. The strong inorganic acids are mineral or corrosive acids.

The official concentrated acids are not of uniform strength, but the official diluted acids have a uniform strength of 10

percent, with the exception of diluted acetic acid and diluted nitrohydrochloric acid.

Action of acids.—Mineral acids have an astringent action. When used in concentrated solution, they have a caustic effect on the tissue and may cause the dead and coagulated tissue to drop off. The caustic effect is used to rid the skin of warts and moles.

The natural acid present in the stomach is hydrochloric. In patients having a deficiency of hydrochloric acid in the stomach, diluted hydrochloric acid is given with meals. When taken by mouth, mineral acids should be well diluted and taken through a glass tube to avoid injury to the teeth.

Toxicology.—The most corrosive of the mineral acids are sulfuric, nitric, and nitrohydrochloric. Hydrochloric and phosphoric acids are less corrosive, but they all rapidly destroy organic tissue. Detection of acid poisoning may be aided by the stains produced upon the body or clothing. Sulfuric acid removes water from tissue and blackens organic matter (carbonization). Nitric acid stains a deep yellow. Nitrohydrochloric acid produces a light yellow stain.

The general symptoms of poisoning by mineral acids are similar: intense pain in the mouth, esophagus, and stomach; severe vomiting (with sulfuric acid, the vomitus may be black or tarry); diarrhea; rapid weak pulse; shallow respiration; subnormal temperature; possible ensuing shock. Death from collapse may occur in a few hours. The mind is usually clear until the end nears, when there may also occur a suppression of urine and failure of voice.

Treatment

1. Immediately neutralize the acid with nontoxic alkali such as milk of magnesia or magnesium oxide.
2. Do not give any alkali carbonates, as the carbon dioxide gas may blow up the stomach and damage stomach walls.
3. Do not give an emetic or put down a stomach tube as you may further damage the stomach walls.
4. Give soothing demulcents as starch, egg white, or milk.
5. The patient should then receive symptomatic treatment.

Hydrochloric Acid—Acidum Hydrochloricum, HCl (Muriatic Acid).—The official diluted acid is employed in the treatment of achlorhydria and hypochlorhydria.

Technical Hydrochloric Acid is the muriatic acid of commerce. It contains impurities such as ferric chloride and organic matter, which give it a yellow color. This form of hydrochloric acid must not be confused with the official acid.

Diluted Hydrochloric Acid.—10 percent HCl. Dose: 4 cc. (1 fluidrachm).

Glutamic Acid Hydrochloride—Acid Glutamici Hydrochloridum.—The uses are those of hydrochloric acid in achlorhydria due to pernicious anemia or other causes and hypochlorhydria. Dose: 1 gm. (15 grains). Glutamic Acid Hydrochloride capsules. Dose: 1 gm. (15 grains).

Lactic Acid—Acidum Lacticum, $\text{CH}_3\text{CH}(\text{OH})\text{COOH}$.—A clear, colorless, syrupy liquid. It is used as a spermatocide and in baby formulas.

Trichloroacetic Acid—Acidum trichloroaceticum, $\text{Cl}_3\text{C}\cdot\text{COOH}$.—Occurs as colorless crystals.

It is a strong caustic, used primarily in removal of warts, moles, and calluses, largely replacing glacial acetic acid for this purpose. An active germicide, it is occasionally used in the treatment of mouth infections such as Vincent's infection.

ANTACIDS

Antacids are drugs used to counteract too much acid in the stomach or to correct a low alkalinity in the body fluids.

Action.—Normally there is a certain degree of acidity in the stomach. The stomach contents may become too highly acid, irritating the mucous membrane and causing symptoms commonly spoken of as indigestion or dyspepsia. Antacids, such as sodium bicarbonate, magnesium oxide, magnesium carbonate, or milk of magnesia are indicated in this condition. The intestinal tract is normally slightly alkaline. As a result of disease it may become acid, usually causing diarrhea. Chalk is the drug of choice in the treatment of intestinal acidity.

OXIDES AND HYDROXIDES

Action.—These drugs neutralize acids and dissolve proteins, and in a lesser degree combine with fats while acids simply kill tissue, caustic alkalis actually dissolve it, producing an effect both quicker and deeper. Since caustic alkalis produce such local irritation, they are not generally used as antacids. Certain insoluble oxides and hydroxides, such as those of calcium and magnesium, are frequently used to correct acidity in the stomach.

Toxicology of Caustic Alkalis.—Those which will be referred to are sodium and potassium hydroxide (lye).

Symptoms are pain in the throat and epigastrium, with nausea and vomiting. The vomitus may be dark brown, due to the presence of decomposed blood. The mucous membrane of the mouth is slippery and swollen, often brownish in color. In severe cases, shock may ensue. If the patient survives, a stricture of the esophagus, due to the local caustic action, may develop.

Treatment

1. Neutralize the alkali. Give diluted acetic acid, vinegar, two tablespoonfuls of vinegar in a half glass of water. Lemon juice may be used, or well-diluted mineral acids.

2. Olive oil or other fixed oils are effective as demulcents.

3. Do not use a stomach tube or emetic. After neutralization of the alkali, treat the patient symptomatically.

Magnesium Oxide—Magnesii Oxidum, MgO (magnesia, light magnesia).—Very bulky white powder; identical chemically with heavy magnesium oxide, U. S. P.

It is an excellent gastric antacid. In large doses it is a saline laxative. Dose: antacid, 0.25 gm. (4 grains); laxative, 4 gm. (60 grains).

Magnesia Magma—Magma Magnesiae (Milk of Magnesia).—A suspension of magnesium hydroxide containing 7 to 8.5 percent of $Mg(OH)_2$. The U. S. P. permits use of a suitable flavoring to make this preparation more palatable.

The therapeutic uses for Magnesia Magma are the same as for MgO . Dose: antacid, 4 cc. (1 fluidrachm); laxative, 15 cc. (4 fluidrachms).

CARBONATES

Drugs of this group are efficient antacids. They produce their effect by reacting with the acid, liberating carbon dioxide.

Sodium Bicarbonate—Sodii Bicarbonas, NaHCO_3 (baking soda).—A white crystalline powder, stable in dry air but slowly decomposes in moist air; prepared by passing carbon dioxide into a very cold saturated aqueous solution of sodium carbonate.

It is used in the treatment of hyperacidity of the stomach and urine. Weak solutions are used frequently as irrigations and washes. Dose: 2 gm. (30 grains).

Heat should not be used to dissolve sodium bicarbonate, as this will cause the bicarbonate to change to carbonate, which produces a local irritant effect similar to the caustic alkalis.

Prepared Chalk—Creta Praeparata, CaCO_3 (drop chalk).—A white to grayish white powder, often prepared in cones. It is odorless, tasteless, and stable in air.

It is used as an effective gastric antacid; also very effective in the treatment of diarrhea. Dose: 1 gm. (15 grains).

MISCELLANEOUS ANTACIDS

This group includes some of the newer drugs employed as gastric antacids, particularly those used in the treatment of peptic ulcer. These drugs are also excellent adsorbents.

Magnesium Trisilicate.—Magnesii trisilicas.

Action.—It is one of the newer gastric antacids, also an effective adsorbent.

Used in the treatment of peptic ulcer. Dose: 1 gm. (15 grains).

Magnesium Trisilicate Tablets.—Dose: 1 gm. (15 grains).

Aluminum Hydroxide Gel—Gelatum Alumini Hydroxidi (Colloidal Aluminum Hydroxide).—A white viscous suspension.

Action.—Used in gastric hyperacidity, and peptic ulcer; and in the treatment of intestinal toxemia as an adsorbent

for toxins, gases, or bacteria. It also acts as a protective and demulcent, to inflamed areas of gastrointestinal tract. Dose: 8 cc. (2 fluidrachms).

Dried Aluminum Hydroxide Gel—*Gelatum Alumini Hydroxidi Siccum*.—It has the same therapeutic action and uses as the suspension. Dose: 0.6 gm. (10 grains).

Aluminum Phosphate Gel—*Gelatum Alumini Phosphatis*.—A white viscous, aqueous suspension.

Action.—It is used as a gastric antacid and demulcent in the treatment of peptic ulcer, particularly when associated with diarrhea, low phosphorus diet, or deficiency of pancreatic juice. It has less acid combining power than aluminum hydroxide gel, but it has the advantage of being capable of absorption. Dose: 8 cc. (2 fluidrachms).

DIGESTANTS

Digestants are drugs which promote the process of digestion. They have a limited use, to replace certain substances which may be lacking for proper digestion. Hydrochloric acid, the enzymes of the stomach, pancreas, and bile are digestants.

Pancreatin—*Pancreatinum*.—A cream colored powder; contains enzymes, principally pancreatic amylase, trypsin, and pancreatic lipase, obtained from the fresh pancreas of the hog, *sus scrofa*, or the ox, *bos taurus*.

Action.—It is used in the treatment of various forms of digestive failure. It is capable of digesting fats, proteins, and carbohydrates. The enzyme amylase acts upon carbohydrates, trypsin upon protein, and lipase upon fats. Dose: 0.5 gm. (7½ grains).

Pepsin—*Pepsinum*.—Occurs as lustrous transparent yellow scales; contains a protein splitting enzyme; obtained from the stomach of the hog.

Pepsin is a normal enzyme of the stomach, necessary for the breaking down of protein. It is active only in a slightly acid medium. The HCl the stomach supplies the necessary acid medium for the pepsin and also activates the pepsinogen to form pepsin.

It is used in combination with dilute HCl in gastric achylia and occasionally as a digestant. It is also used in the form of elixirs as vehicles in pharmacy. Dose: 0.5 gm. (7½ grains).

Compound Pepsin Elixir—(Lactated Pepsin Elixir, Compound Digestive Elixir).—Dose: 8 cc. (2 fluidrachms).

Rennin.—Renninum is a normal enzyme of the stomach, its function being to curdle milk, precipitating the protein casein. Obtained from calf stomach and used in yellowish-white powder.

It is used chiefly in the preparation of infant and convalescent foods. The whey left by the precipitation of the protein of the milk is often used in infants' formulas, when a protein-free formula is desired.

Ox Bile Extract—Extractum Fellis Bovis (Powdered Oxgall Extract).—A brownish-yellow, greenish-yellow, or brown powder, having a bitter taste.

Action.—Bile is essential for the normal digestion of fats. The normal constituents of bile are the bile salts, sodium glycocholate and sodium taurocholate; the bile pigments, bilirubin and biliverdin; cholesterol and lecithin. Of these, the most important are the bile salts, which are necessary for the absorption of fats and certain fat soluble vitamins K, D, A, and carotene.

Bile salts stimulate the flow of bile and also have a stimulating effect on the intestinal musculature, producing a catharsis. Parenteral administration produces a greater intestinal stimulation than oral.

It is used as a chloretic; to promote absorption of vitamin K; in treatment of hepatic insufficiency, hepatic jaundice, and cirrhosis of the liver. Dose: 0.3 gm. (5 grains).

CATHARTICS

Cathartics are drugs which promote evacuation of the bowels. They are used primarily to empty the colon, as in the treatment of simple constipation, and to rid the intestine of any irritant or toxic substances, as in enteritis.

Cathartics may be classified:

1. According to their intensity of action, as aperients,

laxatives, purgatives, hydragogues, and drastics. Chologogues may be included here, as some promote defecation by stimulating the flow of bile.

2. According to their mechanism of action, as irritant cathartics, bulk cathartics, and emollient cathartics.

The cathartics listed here will be discussed according to their mechanism of action.

Irritant Cathartics

The irritant cathartics act by irritation of the intestinal tract. They stimulate peristaltic movements, which may lead to a rapid propulsion of the intestinal contents. The irritant cathartics will be grouped according to their active constituents, under the heading of "Emodin Cathartics," "Resinous Cathartics," "Irritant Oil Cathartics," and "Miscellaneous Cathartics."

Emodin Cathartics

These cathartics have emodin as the active constituent.

Action.—They have little effect on the upper bowel, but they produce catharsis by prompting peristalsis of the colon. They are less likely to cause secondary constipation and have a tendency to restore the tone of the intestines. They are therefore cathartics of choice in the treatment of habitual constipation.

Cascara Sagrada—Cascara Sagrada (*Rhamnus Purshiana*, Sacred Bark).—The dried bark of *rhamnus purshiana*: The taste is bitter and acrid.

Cascara sagrada bark should not be used for a year after it is collected, as it contains an irritant ferment when fresh, which may cause severe griping. Cascara sagrada is the most popular of the emodin cathartics. Its action is mild and unaccompanied by discomfort.

Resinous Cathartics

The action of the cathartics of this group depends on the irritant resins they contain.

Action.—They produce profuse watery stools, cause considerable griping, and are capable of setting up a gastro-

enteritis violent enough to threaten life. They are too severe to be used alone, but they are frequently combined with milder cathartics to increase their action in the treatment of obstinate constipation. They are sometimes used in the treatment of dropsy to evacuate the fluid.

Podophyllum.—Podophyllum (Mandrake, May Apple).

Action.—The resin of podophyllum is a powerful irritant, even when applied to the skin. Small amounts of the drug produce copious, soft stools usually unaccompanied by any marked intestinal irritation. Larger doses cause watery stools tinged with blood. The crude drug podophyllum is seldom used, being replaced by the official resin of podophyllin.

Resin of podophyllin has been shown by recent clinical trials to be effective in the treatment and removal of venereal warts. The application of a mineral oil suspension of the resin to the growth results in shrinking within a few hours, a noticeable decrease in size within two days, and disappearance, with little or no scarring, in from three to six days. Care must be taken to avoid application on the tissue around the warts because of the irritating effect.

Podophyllum Resin—Resina podophylli (podophyllin).—Dose: 10 mg. ($\frac{1}{8}$ grain).

Colocynth.—Colocynthis (colocynth pulp, bitter apple).

The active principles of colocynth are a resin and an alkaloidal substance. It is a powerful drastic cathartic, capable of producing poisoning in overdose. It is usually administered in combination with other cathartics. Dose: 0.125 gm. (2 grains).

Colocynth Extract.—Dose: 30 mg. ($\frac{1}{2}$ grain).

Compound Colocynth and Jalap Pills.—Dose: 1 pill.

Irritant Oil Cathartics

Of the irritant oil cathartics, only castor oil will be discussed here. Another, croton oil, which was official in the N. F. VII, is a powerful drastic cathartic, capable of blistering the skin, and should be administered with care, remembering that the dose is only 1 minim.

Miscellaneous Cathartics

Phenolphthalein—Phenolphthaleinum.—Occurs as a white or faintly yellowish-white crystalline powder. It is odorless and stable in air.

Action.—Phenolphthalein acts both by its local irritant effect on the intestinal tract and by direct motor stimulation of the intestines. The greatest effect is produced on the colon, although there is some action in the small intestine. The cathartic action is not accompanied by any griping or colic. As it is tasteless and odorless, it is a pleasant cathartic to take and is an ingredient in many of the proprietary preparations, a number of which are made in the form of candy, or gum. Dose: 60 mg. (1 grain).

Phenolphthalein Tablets.—Dose: 60 mg. (1 grain).

Bulk Cathartics

The bulk cathartics act by increasing the bulk of the intestinal contents. They are divided into saline cathartics and hydrophilic colloids.

Saline Cathartics

Action.—The action of all the saline cathartics is identical. They are absorbed slowly, so they are retained in the intestinal tract for a comparatively long period. As the intestinal wall acts as a semipermeable membrane between the intestinal contents and circulation, fluid will pass between the circulation and the intestinal tract until the solution of the saline cathartic is rendered isotonic with the body fluids. Therefore, if large amounts of the salt are taken, the volume of water retained in the intestinal tract is considerable and exerts a mechanical stimulus which increases peristalsis. The contents of the colon remain liquid and are rapidly expelled.

Since the action of the salines removes a considerable amount of water from circulation, hypertonic solutions of certain cathartic salts may be given solely for their dehydrating effect. When salines are used for catharsis, sufficient water should be administered by mouth to avoid loss of water.

Magnesium Sulfate—Magnesii Sulfas, $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$. (Epsom salt).—Besides being used for its salt action as a cathartic, Magnesium Sulfate is frequently employed as an anticonvulsant, as the magnesium ion acts as a depressant to the central nervous system. Dose: 15 gm. (4 drachms).

Magnesium Sulfate Injections.—Contain 46 to 53 per cent MgSO_4 . Dose: 1 gm. MgSO_4 .

Magnesium Citrate Solution—Liquor Magnesii Citratis (Lemon Purgative).—A pleasantly flavored cathartic prepared by the reaction between magnesium carbonate and citric acid, producing an effervescent solution. Dose: 200 cc. (7 fluid ounces).

Sodium sulfate—Sodii sulfas, $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$. (Glauber's salt).—It is a very efficient cathartic, equal in effectiveness to Epsom Salt and superior in not being toxic after absorption, but its taste makes it the most objectionable of the saline cathartics. Dose: 15 gm. (4 drachms).

HYDROPHILIC COLLOIDS

Cathartics of this type are so called because they have the properties of absorbing water and swelling. They usually consist of indigestible fibers and are frequently used to augment the diet that is deficient in indigestible residue. They increase the bulk in the intestines and also act as demulcents or lubricants in facilitating the passage of the feces.

Agar—(Agar-Agar).—Agar is frequently used alone, cut into small pieces and eaten as a cereal with cream and sugar, or it may be combined with a drug such as cascara sagrada to increase the cathartic action. It is also used as a culture medium for bacteria. Dose: 4 gm. (1 drachm).

Plantago Seed—Plantaginis Semen (Psyllium Seed, Plantain Seed, Flea Seed).—Psyllium seed contains a large amount of mucilage and swells in the intestines to form an indigestible emollient mass. It is usually taken whole with fruit juice, or the gelatinous mass which forms from contact with water may be mixed with foods. It should never be taken dry. The seed has a tendency to irritate the

intestine enough to create a spasm. Dose: 7.5 gm. (2 drachms).

Methylcellulose—Methocel.—It is a white fibrous material, dissolving in cold water to a clear jelly which coagulates on heating and redissolves on cooling. It is nontoxic and is not absorbed from the digestive tract. Methylcellulose is used as a hydrophilic laxative.

EMETICS

Emetics are drugs which cause vomiting, either by direct stimulation of the vomiting center in the medulla or by irritant action on the oropharyngeal and gastrointestinal tracts. Emetics are used to evacuate irritant or toxic substances from the stomach. Because of their tendency to increase bronchial secretions, some are also used as expectorants.

Certain drugs, such as mustard, zinc sulfate, copper sulfate, and tartar emetic, are useful as emetics because of their irritant action, but they are discussed elsewhere under their more important therapeutic uses.

Apomorphine Hydrochloride—Apomorphinae Hydrochloridum.—The hydrochloride of an alkaloid prepared from morphine; it is odorless.

Action.—Apomorphine produces emesis by stimulation of the vomiting center in the medulla. It is most effective when given parenterally. Vomiting usually occurs within 10 to 15 minutes after administration, preceded by nausea and salivation. Care must be taken not to give an overdose, as it has a central depressant effect and may produce collapse or death. In small doses, about $\frac{1}{10}$ gr., apomorphine may be used as an expectorant in the treatment of bronchitis. Dose: emetic, subcutaneous, 5 mg. ($\frac{1}{2}$ grain).

Ipecac—Ipecacuanha (ipecacuanhae radix P. I.).—Ipecac contains three important alkaloids; emetine, cephaeline, and psychotrine. Cephaeline is most irritating, producing nausea and vomiting. Emetine is somewhat irritant and is capable of producing nausea, but its chief use is as an amebacide.

Ipecac is rather slow in its emetic action, requiring from 30 minutes to an hour to take effect. It is sometimes used as an expectorant and a diaphoretic. Dose: emetic, 0.5 gm. ($7\frac{1}{2}$ grains).

Ipecac Fluidextract.—Dose: 0.5 cc. (8 min.).

Ipecac Syrup.—Dose: Emetic, 8 cc. (2 fluidrachms).

Ipecac and Opium Powder—Dose: 0.3 gm. (5 grains).—The Ipecac and Opium preparations are used as diaphoretics and sedatives.

EXPECTORANTS

Expectorants are drugs which are used to increase bronchial secretions.

Antimony Potassium Tartrate—Antimonii Potassii Tartras (Tartar Emetic).—Antimony salts are very irritant to the stomach and produce nausea and sometimes severe vomiting. Tartar emetic is far too dangerous to prescribe as an emetic. It can be used as a nauseating expectorant in small doses and is an ingredient in brown mixture and compound syrup of squill. Dose: Oral, as expectorant, 3 mg. ($\frac{1}{20}$ grain); intravenous for tropical disease, 30 mg. increasing to 150 mg. ($\frac{1}{2}$ to $2\frac{1}{2}$ grains).

PROTECTIVES AND INERT SUBSTANCES

Bismuth Salts.—The insoluble salts of bismuth are used chiefly in the treatment of ulcerations and inflammations of the digestive tract.

They are usually administered suspended in water, at intervals of 2 to 4 hours. The theory on which they are used is that they coat the crater of the ulcer and afford mechanical protection. Some bismuth salts are employed locally as a protective to the skin and open cuts. Some are effective in the treatment of syphilis, being commonly used in conjunction with arsenicals, as an adjuvant during intervals between arsenical administrations.

Toxicology.—Symptoms are ulcerative stomatitis, salivation, blue gum line, the blue sometimes becoming darker

and spreading to the whole mouth, nephritis, vomiting, and possible methemoglobinemia.

Bismuth Subcarbonate—Bismuthi Subcarbonas (Basic Bismuth Carbonate).—Dose: 1 gm. (15 grains).

Bismuth Subcarbonate Tablets.—Dose: 1 gm. (15 grains) of bismuth subcarbonate.

Bismuth Subnitrate—Bismuthi Subnitras (Basic Bismuth Nitrate).—Dose: 1 gm. (15 grains).

ADSORBENTS

Adsorption is the attachment of one substance to the surface of another by the adhesion, in an extremely thin layer, of the molecules of gases, dissolved substances, or liquids to the surfaces of solid bodies with which they are in contact. Many powders possess adsorptive powers, and they are termed adsorbents.

Adsorbents are effective in the treatment of various intestinal disorders, such as diarrhea caused by food poisoning or dysentery, chronic ulcerative colitis, and intestinal fermentation. They are also effective in the treatment of alkaloidal poisoning and poisoning by salts of certain heavy metals.

IRRITANTS

Irritants are drugs which act locally on the skin to produce inflammation. They injure protoplasm, and the reaction which follows is an effort of the defense mechanism to protect the tissue. The response to the application of the irritant is an increased circulation to the affected part, accompanied by a localized vasodilation, followed by a feeling of warmth, comfort, and sometimes itching.

Irritants are classified as:

1. Rubefacients, or drugs which produce redness of the skin.
2. Vesicants, drugs which are capable of producing blisters.

Blisters are formed when the irritation has caused a wide dilation of the capillaries, permitting the plasma to escape

into the extracellular spaces and collect under the skin. Drugs may possess both rubefacient and vesicant properties, depending on the concentration and period of application.

When irritant substances are used to excite a reflex influence on some part of the body other than that to which they are applied, they are called counterirritants. They help to alleviate pain, congestion, and spasms by the irritation of the skin.

Drugs are now little used to produce an irritation or counterirritation. Physical therapy is usually employed, in the form of heat pads, hot wet packs, diathermy, infrared lamps, and other methods.

Certain drugs, such as camphor, chloroform, turpentine, and methyl salicylate, are used as irritants but are discussed elsewhere under their more important uses.

ASTRINGENTS

Astringents are drugs which have the power of contracting tissue, usually by the precipitation of protein. Both their penetrating power and their precipitating power are weak, so only the surface cells are affected. When applied to animal tissue, astringents combine with the protein to form a hard, insoluble coagulum. The coagulum acts as a protective covering so the astringent is unable to penetrate more deeply, and there is little or no damage to the underlying tissue.

The term "astringent" is also applied to certain drugs, such as epinephrine and ephedrine, which have the power of shrinking mucous membrane and raw tissue without precipitating protein.

Astringents are divided into two groups, vegetable and mineral, according to their origin.

Therapeutic uses of astringents:

1. To check excessive secretion in diarrhea and to check excessive secretion of sweat.
2. In the treatment of a relaxed condition of the throat.
3. To stop bleeding in local hemorrhage.
4. To promote healing by mild irritation.

Vegetable Astringents

The vegetable astringents owe their action to the presence of tannic acid. The drugs mentioned here, with the exception of tannic acid, are used primarily in the treatment of diarrhea. Tannic acid is not used for this purpose because it is very soluble, so that its action takes place in the stomach and is completed before it passes through the intestines. In the relatively insoluble derivatives and combinations of tannic acid, the tannin is partially protected by colloidal material against the albumins of the stomach, and it reaches the intestines in an active state.

Tannic Acid—*Acidum Tannicum* (Gallotannic Acid, Tannin).—Tannic acid is one of the most valuable astringents. It is used externally in the form of ointment or spray of a weak solution to check secretion in weeping ulcers, bedsores, and similar conditions; as a styptic in treatment of local hemorrhage; in ointment or suppositories in the treatment of hemorrhoids; in solutions or lozenges in the treatment of relaxed conditions of the throat; occasionally as a chemical antidote in alkaloidal or heavy metal poisoning.

Mineral Astringents

The mineral astringents include certain acids and salts of heavy metals. Some of the organic acids do not ionize easily enough to be caustic, but they are recognized astringents. These include acetic and citric acids.

Alum—*Alumen* (Ammonium alum, $\text{AlNH}_4(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$; Potassium Alum, $\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$).—It is used extensively as a local astringent in excessive sweating, especially of the feet; also used as a styptic, as an astringent in vaginal douches, and internally in the treatment of lead colic to precipitate the lead in the intestinal tract.

Aluminum Sulfate—*Alumini Sulfas* $\text{Al}_2(\text{SO}_4)_3 \cdot 18\text{H}_2\text{O}$.—It is used as an external astringent for practically the same purposes as alum. In pharmacy it is used in the manufacture of solution of aluminum subacetate.

Aluminum Acetate Solution—(Burow's Solution).—Both of these preparations are used as astringents.

Zinc Sulfate—Zinci Sulfas, $\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$.—(White Vitriol).—It is used internally as an emetic. It is one of the most valuable emetics in various poisonings. It works quickly and efficiently, and there is no danger of poisoning because of the promptness of the emesis produced. Dose: Emetic, about 20 grains in a half tumblerful of water.

It is also used as an antiseptic and astringent in irrigating washes for the eye, nose, throat, urethra and vagina.

Toxicology.—Symptoms are vomiting, retching, restlessness, state of anxiety, and extreme prostration. The treatment consists of the use of alkali carbonates as the chemical antidote, free use of demulcents, such as egg white, milk, mucilage of acacia, opiates to allay vomiting, and other symptomatic treatment.

Lead Salts

The soluble salts of lead are actively astringent but less irritating than most of the other mineral astringents. The insoluble salts are used as mechanical protectives. In spite of their insolubility, when they are applied to raw surfaces or mucous membranes they may be absorbed in quantities large enough to produce chronic poisoning. Lead is a slow insidious, powerful poison.

Toxicology.—Acute lead poisoning results usually from swallowing a soluble lead salt, but occasionally from large doses of an insoluble lead salt. The first symptom is a persistent, sweet, metallic taste, followed by vomiting, the vomitus often milky white from presence of lead chloride. There is epigastric pain and excessive thirst, sometimes obstinate constipation or diarrhea, the stools black from the presence of lead sulfide. Nervous symptoms or disordered circulation, with cramps in the calves of the legs and severe neuralgic pains in the extremities, paralysis, stupor, and collapse may occur.

Treatment

1. Gastric lavage with such chemical antidotes as magnesium or sodium sulfate, which form insoluble lead sulfate. If given in excess, they will also act as cathartics to rid the bowel of the poison.

2. If these are not available, sodium chloride (table salt) may be used.

3. The patient should be treated symptomatically and opiates given to relieve the pain.

Toxicology.—Chronic lead poisoning, called lead colic, occurs among people who are exposed daily to lead compounds. The symptoms are colicky pains in the abdomen, which increase in intensity until they are severe, often with retching and vomiting, rigid and knotted abdominal walls, constipation, a white coating on the tongue, lack of appetite, and excessive thirst. Among the more important diagnostic symptoms are the blue line on the margin of the gums, although this is not always present, basophilic degeneration of red cells, wrist drop due to paralysis of the extensor muscle of the forearm, jaundice, emaciation, metallic taste in the mouth, albuminuria, hematuria, decrease in hemoglobin and red blood cells, and general weakness.

Treatment

1. Remove the source of poisoning and the elimination of the poison with the use of drugs, such as sodium citrate, which increase the urinary excretion of lead and reduce the toxic symptoms.

2. An increase intake of calcium, together with vitamin D and phosphorus, aids in the elimination of lead from the bones.

3. Morphine may be used to relieve the pain.

4. Atropine, nitrites, and papaverine as antispasmodics.

5. Electric treatment for nervous disorders.

DIURETICS

Diuretics are drugs which increase the secretion of urine. They are used to remove fluid from the body, as in dropsy or edema, to dilute the urine and render it less irritating to the mucous membrane of the bladder, and to aid in eliminating toxic matter through the kidney. Diuretics should be employed with caution, particularly in certain inflammatory and diseased conditions like nephritis, when the kidney is frequently incapable of responding to the diuretic action.

The daily urine output in a healthy man is about 1,500 cc. The amount secreted depends upon the functional state of the kidney epithelium and the amount of blood passing through the renal artery. The blood supply to the kidney is influenced by the total quantity of blood in the body, the velocity of the blood current, the relative size of the renal artery and the general arterial system.

Diuretics are divided into three classes:

1. Saline diuretics, which increase the blood volume by their salt action.
2. Stimulant diuretics, which have a direct action on the kidney.
3. Circulatory stimulants, which increase blood pressure.

Saline Diuretics

Saline diuretics act by osmosis. When a concentrated salt enters the blood vessels, fluid passes into them from the surrounding tissues until the blood stream again becomes isotonic, increasing the circulating blood volume and thus producing a diuretic effect. Certain crystalloids, such as sucrose, glucose, and urea are effective diuretics. Some saline diuretics also produce a sudorific effect, since the elimination of the excess fluid in the blood stream is partly performed by the sweat glands.

Action.—The cations potassium and sodium play an important part in the action of the saline diuretics. Potassium is the chief cation of the intracellular fluid and is also present in small quantities in the extracellular fluid. Human serum contains about 20 mg. of the K. ion in 100 cc. It cannot be replaced in the cell by any other ion. It is readily absorbed when administered either orally or parenterally. The daily diet usually supplies a sufficient quantity, as it is widely distributed in plants and animals.

The kidney rejects potassium readily, and if an excess of its salts is administered by mouth, it is excreted so rapidly that it is difficult to detect any change in the blood concentration. This action of the kidney may be the basis for the diuretic action of some potassium salts.

An increase of potassium may cause diaphoresis and increase of bronchial secretions.

Potassium is a universal depressant, affecting the central nervous system and circulation and in sufficient doses having a direct action on all muscle fiber. As a remedial agent, it is not likely that the salts of potassium will be required for the cation effect. There is little danger of undesirable depressant effects from oral administration of moderate doses if the kidneys are normal.

Sodium is physiologically inert. It is the cation of the extracellular fluid. It is present in the body in large quantities, and apparently its function is purely osmotic, since it has no effect on tissues. Any change in the sodium concentration in the body fluid may cause abnormal fluid distribution and resulting serious disturbances.

Sodium Citrate—Sodii Citras, $\text{Na}_3\text{C}_6\text{H}_5\text{O}_7 \cdot 2\text{H}_2\text{O}$.

Action.—Citrates are used in medicine as diuretics, diaphoretics, saline expectorants, and systemic alkalizers. In the body they counteract systemic hyperacidity. Sodium citrate is also used as an anticoagulant in blood transfusions. It is employed in the official anticoagulant solution. Dose: 1 gm. (15 grains).

Sodium Chloride—Sodii Chloridum, NaCl (table salt).

Action.—Sodium Chloride is a very effective diuretic. It causes a copious flow of urine, thus promoting excretion of toxic matter. Large amounts of an isotonic solution can be administered parenterally without materially changing the composition of the extracellular fluid because of the presence of the Na ion. It is also used to remedy conditions resulting from loss of NaCl , such as heat stroke or loss of blood by hemorrhage or surgery, to prevent dehydration in burns, sometimes in failure of gastric secretion, and occasionally to raise the blood pressure in hypotension.

Isotonic Sodium Chloride Solution—(Normal Saline Solution).—A solution of 0.90 percent NaCl .

Ammonium Chloride—Ammonii Chloridum, NH_4Cl (Muriate of Ammonia).

Action.—It is a powerful diuretic. In the liver it is converted to urea and leaves an excess of anion in the extra-

cellular fluid. Too large a dose may cause severe acidosis. It is an effective expectorant in bronchitis. Dose: Expectorant, single dose, 0.3 gm. (5 grains): Diuretic, daily dose, 4 gm. (60 grains).

Stimulant Diuretics

Mercurophylline.—A white or yellow odorless powder.

Action.—Mercurials are powerful and effective diuretics, acting by reducing tubular reabsorption. The release of the mercuric ion from these compounds probably accounts for their effect on the kidney. The diuretic effects of the organic mercurials seem to be increased by the addition of theophylline, and at the present almost all of the mercurial diuretics are combined with theophylline. Intramuscular injection gives the best results.

Mercurial diuretics are used mainly in the treatment of cardiac edema, sometimes in chronic nephrosis and ascites due to diseased liver.

Mercurophylline Injection—(Mercuzanthin Solution)—Injection *Mercurophyllinae* (Mercuzanthin).—Dose: Average dose of mercurophylline, intramuscular, an amount equivalent to: the mercuri compound, 0.1 gm. ($1\frac{1}{2}$ grains): theophylline, 40 mg. ($\frac{3}{4}$ grain).

Mercurophylline Tablets—(Mercuzanthin Tablets).—Dose: The mercuri compound, 80 mg. ($1\frac{1}{2}$ grains); theophylline, 30 mg. ($\frac{1}{2}$ grain).

Meralluride—(Mercurhydrin).

Action.—It is used as a mercurial diuretic in the treatment of edema associated with cardiorenal disease or nephrosis and acts by reducing the tubular resorption of water. Its use is contraindicated in acute nephritis, kidney disease associated with nitrogen retention, colitis, and myocardial infection.

Meralluride Injection—(Solution Mercurhydrin Sodium).—Dose: An amount equivalent to 39 mg. ($\frac{3}{4}$ grain) of mercuri compound and 48 mg. ($\frac{3}{4}$ grain) of theophylline.

Mersalyl—(Salysgan).

Action.—It is believed to be less toxic and more active than the purine-free mercurial diuretics. The presence of

theophylline increases the rate and completeness of absorption. It is used to remove excess fluid in edema of congested heart failure, nephrosis, and cirrhosis of the liver.

Mersalyl and Theophylline Tablets.—Dose: An amount equivalent to mersalyl, 80 mg. ($1\frac{1}{4}$ grains), and theophylline, 40 mg. ($\frac{1}{2}$ grain).

Mersalyl and Theophylline Injection.—Dose: An amount equivalent to mersalyl, 0.2 gm. and theophylline, 0.1 gm.

Urea—Urea, $\text{NH}_2\text{—CO—NH}_2$ (Carbamide).—A very active diuretic, used in the treatment of cardiac edema and chronic nephrosis. It is administered with fruit juices, iced drinks, or flavored syrups to mask its taste; also used in treatment of infected wounds, as it aids in the removal of necrotic tissue and has some antiseptic value. Dose: 8 gm. (2 drachms).

Dextrose—Dextrosum, $\text{C}_6\text{H}_{12}\text{O}_6\cdot\text{H}_2\text{O}$ (d-Glucose).—As a diuretic, it is usually employed as a hypertonic solution, intravenously. It is also used in isotonic solutions as a nutritive, and in combination with saline solution to combat circulatory failure due to hemorrhage or shock.

Dextrose Injection.

Dextrose and Sodium Chloride Injection.

Sucrose.—Sucrosum, $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ (Saccharum, Sugar).

Action.—As a diuretic, it is administered intravenously. It must be used with caution, as it may cause severe renal injury. It has an advantage over dextrose in that it is not metabolized when given intravenously and circulates as a foreign substance until excreted, while dextrose is the natural sugar of the body, and some of it may be deposited as glycogen in the liver. Sucrose is also used orally as a nutritive and in pharmacy as a sweetening agent and an excipient for pills, masses, and troches.

CHOLERETICS

Choleretics are drugs used for their ability to increase the volume of bile. They do not stimulate the evacuation of the gallbladder. Their effect on the secretion of bile constituents is uncertain. They may be of value to encourage drainage of the bile ducts by the removal of mucus and to keep infection

from these structures in cholecystitis and other conditions involving biliary stasis not due to complete obstruction.

Dehydrocholic Acid—*Acidum Dehydrocholicum* (Decholin).—Dose: oral, 0.25 gm. (4 grains).

Dehydrocholic Acid Tablets.—Dose: 0.25 gm. (4 grains).

Sodium Dehydrocholate Injection.—Dose: 2.0 gm. (30 grains).

CARDIAC DRUGS

DIGITALIS GROUP

Digitalis and closely allied drugs have a powerful action on the heart muscle and are invaluable in the treatment of various forms of chronic heart disease and cardiac failure. In therapeutic doses they cause an increase in the force of the systolic beat, improving nutrition to the heart and the body generally, and a slowing of the cardiac rate, giving the heart more time to rest.

Action.—In moderate doses the cardiac drugs may produce a constriction of the arteries, but the blood pressure is seldom affected, due to the slow pulse. In patients with cardiac failure, they may cause variable changes in blood pressure. When there is an accumulation of fluid in the body, as in dropsy, the cardiac glucosides cause profuse diuresis, probably due to improved circulation.

The cardiac drugs and glucosides are used for the treatment of congestive heart failure, auricular fibrillation, and paroxysmal tachycardia.

They all act directly on the heart muscle. They diminish the size of the heart. While they increase the output of the diseased heart, they diminish the output of the normal heart. In patients with auricular fibrillation they all slow the heart rate.

The drugs of the digitalis group are assayed biologically on the pigeon, and the potency is spoken of in U. S. P. units. One U. S. P. unit is equivalent to 0.1 gm. of powdered digitalis U. S. P. The U. S. P. XIII assayed digitalis on the cat, one U. S. P. unit being equivalent to approximately 1.3 cat units.

Digitalis—*Digitalis* (Foxglove, *Digitalis Folium*, P. I.).—The most important glucosides are digitoxin, gitoxin, and gitalin.

Toxicology.—*Digitalis* is a cumulative drug. The symptoms of poisoning are nausea and vomiting, with muscular weakness and possible visual disturbances. The pulse is slow at first but later may become rapid and irregular.

The treatment is discontinuance of administration of the drug, keeping the patient in a recumbent position, evacuation of the stomach if necessary, and symptomatic treatment.

When digitalis is prescribed, powdered digitalis U. S. P. is to be dispensed, because it has a minimum and maximum limit of standard.

Powdered Digitalis.—Dose: 0.1 gm. ($1\frac{1}{2}$ grains).

Digitalis Tablets.—Dose: 0.1 gm. ($1\frac{1}{2}$ grains).

Digitalis Injection.—Dose: as recommended on label.

Digitoxin—*Digitoxinum*.—Digitoxin has an advantage over digitalis in that the dose is smaller and very little nausea and vomiting are produced. In therapeutic doses it rarely produces any side effects, but in toxic doses the symptoms are similar to those of digitalis poisoning. Dose: oral, 0.1 mg. ($\frac{1}{1000}$ grain); intravenous, to be determined according to the needs of the patient.

Digitoxin Injection.—Dose: intravenous, to be determined by the physician according to the needs of the patient.

Digitoxin Tablets.—Dose of digitoxin: 0.1 mg. ($\frac{1}{1000}$ grain).

Digoxin—*Digoxinum*.—Digoxin, like digitoxin, produces the characteristic digitalis effects rapidly. It is given in small dosage. Overdosage may produce toxic symptoms similar to those of digitalis. Dose: oral, 0.5 mg. ($\frac{1}{200}$ grain); parenteral, determined by the needs of the patient.

Digoxin Tablets.—Dose: 0.5 mg. ($\frac{1}{200}$ grain).

Digoxin Injection.—Dose: intravenous, to be determined by physician.

Lanatoside C—*Lanatosidum C*.—A glucoside obtained from the leaves of *Digitalis lanata* (Fam. Scrophylariaceae). White crystals or crystalline powder, insoluble in water.

Its use is similar to that of digoxin. Dose: oral, 0.5 mg. ($\frac{1}{120}$ grain); parenteral, suited to needs of patient.

Lanatoside C Injection.—Dose: To be determined by the physician according to the needs of the patient.

Lanatoside C Tablets.—Dose of Lanatoside C: oral, 0.5 mg. ($\frac{1}{120}$ grain).

Strophanthus.—Strophanthus (Strophanthus Seed).

Action.—Its use is similar to that of digitalis, but since its action is unpredictable it is very seldom used. It is the only drug of the digitalis group which is assayed on the frog. Dose: 60 mg. (1 grain).

Strophanthus Tincture.—Dose: 0.5 cc. (8 min.).

Strophanthin—Strophanthinum.—It is used intravenously for quick digitalization of the patient in cases of immediate danger. If the patient has recently taken digitalis, strophanthin should be administered with great caution. Dose: 0.6 mg. ($\frac{1}{100}$ grain).

Strophanthin Injection.—Dose: intravenous, 0.6 mg. of strophanthin.

Quinidine Sulfate.—Quinidinae Sulfas.

Action.—Quinidine Sulfate is a cardiac drug, but its action differs somewhat from that of the digitalis group. It is a depressant to the cardiac muscle and is used extensively in the treatment of auricular fibrillation and paroxysmal tachycardia. It resembles quinine in being a general protoplasmic poison, in its antipyretic and oxytocic action, and its antimalarial properties. Dose: 0.2 gm. (3 grains).

ACONITE GROUP

This group includes two drugs, aconite and veratrum viride. They cause a slowing of the pulse by stimulation of the cardio-inhibitory center, resulting in a lowering of the blood pressure, often accompanied by sweating. They differ from digitalis in not stimulating the heart or the vasomotor center.

Aconite—Aconitum (Aconite Root, Monkshood, Wolfsbane, Aconiti tuber P. I.).—Aconite is infrequently employed as a cardiac depressant. The drug and its preparations are

often used as a diaphoretic in febrile conditions and locally as an anodyne. Dose: 60 mg. (1 grain).

Toxicology.—In large doses Aconite is a rapid and dangerous poison. The symptoms include a feeling of warmth in the stomach, with or without vomiting, intense weakness, slow respiration, soft, slow pulse which becomes rapid and irregular toward the end. The most characteristic symptom is the peculiar prickling sensation on the tongue and lips, passing to the extremities.

Treatment

1. Keep the patient lying down.
2. Empty the stomach with a stomach pump.
3. A chemical antidote such as Lugol's solution or potassium permanganate may be of some value.
4. Symptomatic treatment should follow.

Aconite Fluidextract.—Dose: 0.06 cc. (1 min.).

Aconite Tincture.—Dose: 0.6 cc. (10 min.).

VASODILATORS

These drugs open up blood vessels or increase the force of the heart beat.

NITRITES

The nitrites relax smooth muscles, especially of the finer blood vessels. A fall in blood pressure is the most important pharmacological action. Their relaxation of the coronary arteries is the basis of their chief use in the relief of pain in angina pectoris. Their action on the blood vessels of the skin produces flushing and sweating. They may produce headache, probably by dilation of the smaller vessels of the meninges, which increase the cranial pressure. They also relax the smooth muscles of the gastrointestinal and genitourinary tracts. Because of their action on the bronchial muscles, they are used in the relief of bronchial spasm.

Large doses of nitrites convert hemoglobin to methemoglobin. In the treatment of cyanide poisoning, where this effect is desired, sodium nitrite or amyl nitrite is used.

Toxicology.—Large doses produce irritation of the stomach, nausea and vomiting, severe headache, confusion, slow pulse, shallow and irregular but somewhat accelerated respiration and methemoglobin.

Treatment

1. If the nitrites were taken orally, use gastric lavage.
2. Inhalations of oxygen.
3. Injection of a small dose of methylene blue.
4. Blood transfusion if methemoglobin is present.
5. Keep the patient's head low.
6. Treat symptomatically.

Amyl Nitrite—Amylis Nitris (Isoamyl Nitrite, Pearl of Amyl Nitrite).—Amyl Nitrite is used where immediate vasodilation is desired, especially in angina pectoris. It increases the circulation in the coronary arteries while lowering the blood pressure. Dose: inhalation, 0.2 cc. (3 min.).

Sodium Nitrite—Sodii Nitris, NaNO_2 .—It is used chiefly in the treatment of arterial hypertension. Its action is very slow, apparently in about 10 minutes and lasting about 2 hours. Dose: 60 mg. (1 grain).

Sodium Nitrite Tablets—Dose: 60 mg. (1 grain).

Glyceryl Trinitrate Tablets—Tabellae Glycerylis Trinitratis, $\text{C}_3\text{H}_5(\text{NO}_3)_3$ (Nitroglycerin Tablets).—Glyceryl trinitrate acts very quickly, the blood pressure dropping within 2 or 3 minutes after oral administration, the action being completed in about $\frac{1}{2}$ hour.

It is used where rapidity of action is desired, as in angina pectoris, threatened apoplexy, and asthma. It should be administered with caution, as it may produce severe headache. Dose: 0.4 mg. ($\frac{1}{50}$ grain).

Glyceryl Trinitrate Spirit—Spiritus Glycerylis Trinitratis (Spirit of Nitroglycerin, Spirit of Glonoin).—It is highly explosive. If tasted or allowed to touch the skin it may cause severe headache.

It has the same use as the tablets. Dose: 0.06 cc. (1 min.).

Erythrityl Tetranitrate Tablets—Tabellae Erythritylis

Tetranitrat, $C_4H_6(NO_3)_4$ (Erythrol Tetranitrate Tablets, Tetranitrol Tablets).—The vasodilating effects of Erythrityl Tetranitrate are less marked but more prolonged than those of other nitrites.

It is used to lower the blood pressure in various circulatory disturbances where constant effect is desired. Dose: 30 mg. ($\frac{1}{2}$ grain).

Ethyl Nitrite Spirit—Spiritus Aethylis Nitritis (Sweet Spirit of Nitre, Spirit of Nitrous Ether).—It is volatile and inflammable and decomposes when exposed to the air.

It has the same action as the other nitrites, but it is used mainly as a diaphoretic in mild fevers, especially in children. Dose: 2.0 cc. (30 min.).

Mannitol Hexanitate Tablets.—Mannitol Hexanitate is an explosive compound formed by the nitration of mannitol. It is much less stable than nitroglycerin. Its use in pharmaceutical preparations is in 10-percent mixture of carbohydrates in which it is nonexplosive. Dose: 30 mg. ($\frac{1}{2}$ grain).

MISCELLANEOUS VASODILATORS

Sodium Thiocyanate.—Sodii Thiocyanas, NaSCN (Sodium Sulfo cyanate).

Action.—Thiocyanates have two major actions in the body. They are similar to iodides, causing cutaneous and mucosal effects characteristic of iodism.

They act like nitrites in relaxing the smooth muscles and are employed for this effect in the treatment of essential hypertension. They must be used cautiously because the rate of excretion is variable and unpredictable, so there is danger of cumulative toxicity, and the dose cannot be relied upon as an index of safety. The patient should be carefully observed and the serum level of the thiocyanate ion controlled. Dose: 0.3 gm. (5 grains).

Toxicology.—Symptoms of thiocyanate poisoning are weakness of the arms and legs, aching and cramps of the calf muscles, nervousness and irritability, mild gastrointestinal complaints, and symptoms of iodism such as coryza and

dermatitis. More severe reactions produce stuttering, loss of speech, hallucinations, confusion, and delirium. In chronic reactions there is secondary anemia, loss of weight, and muscular wasting.

Treatment

1. Discontinue the use of the drug.
2. Treat symptomatically.

Sodium Thiocyanate Elixir.—Dose: 4.0 cc. (1 fluidrachm).

Potassium Thiocyanate—Potassii Thiocyanas, KSCN (Potassium Sulfocyanate).—Has the same action and uses as sodium thiocyanate. Dose: 0.3 gm. (5 grains).

Histamine Phosphate.—Histaminae Phosphas (Histamine Acid Phosphate).

Action.—Histamine is widely distributed in plants and animals. It is a powerful vasodilator, but its many other actions make it unfit for therapeutic use. It lowers the blood pressure but has no direct pronounced heart action. Large doses may produce such a decided fall in blood pressure as to cause shock. The primary cause of histamine shock is the dilation of the capillaries, allowing the escape of plasma from the blood stream and causing a difference between the volume capacity of the circulatory system and the circulating blood volume. Many other varieties of shock are due to this action. In traumatic shock, histamine is released in the body as a result of injury to the tissue cells. In anaphylactic shock, intracellular reaction between the antigen and antibody injures the cell, liberating histamine.

Histamine constricts the bronchioles by direct muscular action. Patients suffering from asthma, emphysema, and bronchitis are most seriously affected. It stimulates the gastric glands by causing an increase in the secretion of gastric juices, and it has a slight stimulating effect on the salivary glands and the intestinal secretions.

It is used as a diagnostic agent in gastric function tests. It is also used to determine the circulatory velocity and in the desensitization of certain allergic types of headache, chronic urticaria, and cold sensitivity. Dose: 0.3 mg. ($\frac{1}{200}$ grain).

Toxicology.—Histamine poisoning is rare, usually the result of an error in dosage. The symptoms are alarming but not very dangerous. There is a fall in blood pressure, with intense headache, bronchial constriction, dyspnea, a metallic taste in the mouth, vomiting, diarrhea, and in severe cases, shock.

Treatment

1. Prompt administration of epinephrine, the physiological antidote.
2. Restoration of the blood volume if shock occurs.
3. Symptomatic treatment.

Histamine Phosphate Injection.—Dose of Histamine Phosphate: intramuscular, 0.3 mg. ($\frac{1}{200}$ grain).

Histidine Monohydrochloride.—Dose: 0.2 gm. (3 grains).

Histidine Monohydrochloride Injection.—Dose: 0.2 gm. (3 grains).

VASOCONSTRICTORS

Vasoconstrictors cause a constriction of the blood vessels. They act on the same mechanism as the vasodilators. They are used to raise the blood pressure, but they have several other uses. Some of them will be discussed elsewhere under their more important pharmacological actions.

Naphazoline Hydrochloride.

Action.—The strong solution should be used only by adults. Only a few drops should be instilled in each nostril and the treatment should not be repeated for several hours.

The mild solution is for use by children.

These solutions should not come in contact with aluminum.

Mild Naphazoline Hydrochloride Solution.—(Mild Privine Hydrochloride Solution 0.05 percent.)

Strong Naphazoline Hydrochloride Solution.—(Strong Privine Hydrochloride Solution 0.1 percent.)

CENTRAL NERVOUS SYSTEM STIMULANTS

Certain drugs stimulate the activity of various portions of the central nervous system. They differ in site and mechanism of action. They are not employed exclusively

as central nervous system stimulants because they have many other actions. The central nervous system can be stimulated only for a brief period as the excitation is soon followed by depression.

Nux Vomica—Nux Vomica (Quaker Buttons, Dog Buttons).—Nux Vomica contains two alkaloids, strychnine and brucine. Its activity resides in strychnine, brucine being relatively weak.

Action.—Strychnine is a powerful stimulant to the central nervous system, particularly the spinal cord and medullary centers. The stimulation of the spinal cord leads to increase activity of the reflexes, and in large doses causes convulsions. Strychnine is a valuable respiratory stimulant and is used as an antidote in poisoning by central nervous system depressants, like the hypnotics. It is also used as a stomachic and bitter.

Toxicology.—The first symptoms of strychnine poisoning is a feeling of stiffness in the face and neck muscles, followed by an increased reflex activity, the smallest stimulus causing a violent response leading to a convulsion. The body is rigid, with the trunk arched backward, the arms flexed, the legs extended, the jaw closed, and the facial muscles drawn into a sardonic grin. Spasm of the abdominal and thoracic muscles is accompanied by arrest of respiration. The eyes bulge, the pupils are contracted, and cyanosis is present. The patient is conscious and in pain and is apprehensive of death. The convulsions last slightly over a minute, then the muscles relax and there is a period of depression, followed in 10 to 15 minutes by another convulsion. Death usually follows the second to fifth convulsion as a result of asphyxia.

Treatment

1. Prevention or control of the convulsions.
2. Quick acting barbiturates, such as amytal sodium administered intravenously, are effective.
3. If these are not available, chloral hydrate, paraldehyde, inhalations of chloroform, or tribromoethanol may be used.
4. After the convulsion has subsided, gastric lavage may be employed to remove the poison from the stomach.

5. Potassium permanganate may be given as a chemical antidote.

6. The patient should be kept under close observation and treated symptomatically.

Strychnine.—Dose: 1.5 mg. ($\frac{1}{100}$ grain).

Strychnine Nitrate.—Dose: 2 mg. ($\frac{1}{50}$ grain).

Strychnine Phosphate.—Dose: 2 mg. ($\frac{1}{50}$ grain).

Strychnine Sulfate.—Dose: 2 mg. ($\frac{1}{50}$ grain).

Picrotoxin—Picrotoxinum (Cocculin).—Picrotoxin is a powerful stimulant to the central nervous system, resembling strychnine in action. It is used intravenously in the treatment of poisoning by hypnotic drugs such as barbiturates, chloral hydrate, paraldehyde, or sulfonal. Dose: intravenous, to be determined according to the needs of the patient.

The toxic symptoms resemble those of strychnine poisoning and the treatment is the same.

Picrotoxin Injection.—Dose: intravenous, to be determined by the physician according to the needs of the patient.

Nikethamide (Coramine).

Action.—It is used both orally and by injection as a respiratory stimulant and as a stimulant in acute circulatory failure not associated with cardiac disease. It has been used as an antidote in barbiturate poisoning with favorable results. Dose: 0.5 gm. ($7\frac{1}{2}$ grains).

Nikethamide Injection.—Dose: 0.5 gm. ($7\frac{1}{2}$ grains).

Pentylenetetrazol.—(Pentamethylenetetrazol, Metrazol).

Action.—It has a powerful stimulating action on the mid-brain and the medullary centers. It is used in the treatment of barbiturate poisoning. It is also used in the shock therapy of mental disorders. It is given orally and by parenteral injection.

Pentylenetetrazol Injection.—Dose: To be determined by the physician.

Xanthine Derivatives

Caffeine, theophylline, and theobromine are called Xanthines. They are all stimulants to the central nervous system, caffeine is the strongest and theobromine the weakest.

Action.—The xanthines affect the circulation. They stimulate the heart muscle directly, cause a relaxation of the coronary vessels, and tend both to constrict the blood vessels by vasomotor stimulation and to dilate by direct effect on the vascular musculature. The end result of these contradictory actions is a slight increase in pressure. These drugs relax the smooth muscles, particularly the bronchi and the biliary tract. They also act as diuretics.

Caffeine.—Caffeina (Theine).

Action.—Caffeine stimulates all parts of the central nervous system, especially the cortex, medulla, and spinal cord. Its action on the cortex produces a clearer and more rapid flow of thought and allays drowsiness and fatigue. It stimulates respiratory, vasomotor, and vagal centers in the medulla.

It is used as a cardiac and respiratory stimulant, as a diuretic in the treatment of dropsy, and for relief of headache. Dose: 0.2 gm. (3 grains).

Caffeine and Sodium Benzoate.—Dose: 0.5 gm. (7½ grains).

Caffeine and Sodium Benzoate Injection.—Dose of caffeine and sodium benzoate: intramuscular, 0.5 gm. (7½ grains).

Citrated Caffeine.—Dose: 0.3 gm. (5 grains).

Caffeine and Sodium Salicylate.—Dose: 0.2 gm. (3 grains).

Theophylline—Theophyllina (Theocin).—It is used as a vasodilator in treatment of coronary thrombosis and angina pectoris. It is also employed to relieve the spasms of bronchial asthma and occasionally as a diuretic. Dose: 0.2 gm. (3 grains).

Theophylline and Sodium Acetate.—Dose: 0.2 gm. (3 grains).

Theophylline and Sodium Acetate Tablets.—Dose: 0.2 gm. (3 grains).

Aminophylline—(Theophylline Ethylenediamine).—Dose: oral, 0.2 gm. (3 grains); intravenous or intramuscular, 0.25 gm. (4 grains); rectal, 0.5 gm. (7½ grains).

Aminophylline Injection.—Dose: intramuscular and intravenous, 0.25 gm. (4 grains).

Aminophylline Suppositories.—Dose: 0.5 gm. (7½ grains).

Aminophylline Tablets.—Dose: 0.2 gm. (3 grains).

Theobromine—*Theobromina*.—A white crystalline powder.

Theobromine and Sodium Acetate—*Theobromina et Sodii Acetas*.—It is used as a vasodilator in conditions of the coronary artery, as a diuretic, and as a cardiac stimulant. Dose: 0.5 gm. (7½ grains).

CENTRAL NERVOUS SYSTEM DEPRESSANTS

Barbiturates

Action.—The barbiturates are a widely used group of central nervous system depressants. They all have the same general action, differing in rapidity, degree, and duration. Their effects range from mild sedation to deep coma. They also produce respiratory depression. Large doses may cause vasodilation accompanied by a fall in blood pressure, injure the liver, and have an antidiuretic effect. The barbiturates are detoxified by the liver and excreted by the kidney. In some cases they are habit forming.

They are used as hypnotics and sedatives, as anticonvulsants, as anesthetics for short or basal anesthesia, and in combination with analgesics to increase their effects. They are administered orally, rectally, subcutaneously, or intravenously.

Toxicology.—Poisoning by barbiturates is characterized by deep sleep or coma, slow respiration, weak, rapid pulse, a fall in body temperature, and moist, cold, cyanotic skin. The capillaries may dilate, and in the later stages shock may ensue. Death occurs from respiratory failure.

Treatment

1. If the barbiturate was taken orally, gastric lavage should be used.
2. Followed by magnesium sulfate to act as a cathartic.
3. Physiological antidotes such as picrotoxin, strychnine, caffeine, ephedrine, or coramine should be given to counteract the depressant effects on the respiration and central nervous system.
4. The patient should be treated symptomatically.

Barbiturates are cumulative poisons and are capable of causing chronic poisoning, with symptoms of drowsiness, failing memory, mental depression, incoherent speech, and disorientation. There may also be various nervous and gastrointestinal disorders, skin rashes, pruritis, loss of weight, and casts and albumin in the urine. The treatment consists of stopping the drug, hospitalization of the patient, and symptomatic treatment.

Barbital—Barbitalum (Diethylbarbituric Acid, Barbitone, Veronal, Diethylmalonylurea).—Barbital is a slow-acting barbiturate and should be taken about 2 hours before sleep is desired. It is used as a hypnotic, sedative, and anti-convulsant. Dose: 0.3 gm. (5 grains).

Barbital Tablets.—Dose: 0.3 gm. (5 grains).

Barbital Sodium—(Soluble Barbital).—Dose: 0.3 gm. (5 grains).

Barbital Sodium Tablets.—Dose: 0.3 gm. (5 grains).

Phenobarbital—Phenobarbitalum (Phenylethylmalonylurea; Luminal, Phenobarbitone).—Phenobarbital acts slowly. It is more powerful than barbital, but its uses are similar. Dose: 30 mg. ($\frac{1}{2}$ grain).

Thiopental Sodium.—Thiopentalum Sodicum (Thiopentone Soluble, Pentothal Sodium).

Action.—Thiopental Sodium acts quickly and is used intravenously for anesthesia in operations of short duration. It should be injected slowly by an experienced person. It is sometimes used to control convulsions in strychnine poisoning. For parenteral use the sterile thiopental sodium should be used, mixed with anhydrous sodium carbonate as a buffer.

Bromides

The bromide ion is a depressant to nerve tissue, but it shows a selective action for the spinal cord. Small doses affect the motor area of the cerebrum; larger doses cause depression of the sensory side of the spinal cord; very large doses cause some mental confusion.

Bromides are used:

1. As sedatives to relieve nervousness and encourage sleep.

They are not true somnifacients but induce sleep by lessening the activity of perception of sense stimuli.

2. As anticonvulsants, particularly in epileptic seizures. They may be used in tetanic convulsions, but their action is rather slow for this purpose.

3. As a sedative to allay pain, control seasickness or vomiting in pregnancy, and to lessen sexual hyperesthesia.

Toxicology.—Excessive use may produce symptoms of chronic poisoning, known as bromidism. The characteristic symptoms are an acne-like eruption of the skin, fetid breath, occasional mental confusion, and muscular weakness. The treatment consists of complete withdrawal of the drug, large doses of sodium chloride, and symptomatic treatment.

MISCELLANEOUS DEPRESSANTS

Diphenylhydantoin Sodium—Diphenylhydantoinum Sodium (Soluble Phenytoin, Dilantin Sodium).—It is used as an anticonvulsant in treatment of epilepsy and is preferred to phenobarbital because it has no hypnotic properties. Occasionally it is combined with phenobarbital to increase its action.

Toxicology.—Dilantin sometimes produces toxic symptoms, such as giddiness, ataxia, nervousness, visual disturbances, slurring of speech, confusion, drowsiness, headache, dyspnea, difficulty in swallowing, acute gastric disturbance, dermatitis, and hyperplasia of the gums. These symptoms are not serious and usually subside upon withdrawal of the drug. Dose: 0.1 gm. (1½ grains).

Diphenylhydantoin Capsules.—Dose: 0.1 gm. (1½ grains).

Trimethadione.—It is an anti-epileptic drug which acts as an anticonvulsant. Dose: 1.0 gm. (15 grains).

Chloral Hydrate—Chloralis Hydras, $\text{CCl}_3\text{CH}(\text{OH})_2$.—It is used as a sedative and hypnotic. In therapeutic doses it causes sedation in 10 to 15 minutes and sleep within an hour. Dose: 0.6 gm. (10 grains).

Toxicology.—The symptoms are deep stupor, marked vasodilation, low blood pressure, fall in body temperature, slow respiration, and cyanosis; occasionally there is delirium or

collapse. Gastric irritation may be followed by vomiting. Death results from respiratory failure.

Treatment

1. Gastric lavage.
2. Warmth.
3. Stimulants as prescribed for barbiturate poisoning.

Paraldehyde—Paraldehydum.—The action of Paraldehyde is similar to that of chloral hydrate. It is a hypnotic and sedative, producing normal sleep, without after effects, in from 10 to 15 minutes. Its hypnotic effects are not as potent as those of chloral, and large doses do not depress respiration.

Paraldehyde has a wide margin of safety, and although excessive doses may cause prolonged unconsciousness, fatalities are rare. The drug should be administered well diluted in a proper vehicle to avoid throat and gastric irritation. Dose: 4 cc. (1 fluidrachm).

Alcohol—Alcohol, C_2H_5OH (Ethanol, Ethyl Alcohol, Spiritus Vini Rectificatus).—Alcohol is a product of fermentation of sucrose by certain yeast enzymes. It may also be prepared synthetically.

Action.—Locally, alcohol injures the tissue cells by precipitating and desiccating protoplasm. It is irritant to open cuts and mucosa. When applied to the skin, it evaporates with a cooling effect. If applied by rubbing, it produces a mild redness and burning. Injected hypodermically, it causes local anesthesia.

Systemically, alcohol is a narcotic. Although in small doses it stimulates the gastric mucosa, increasing the flow of juices, its effect on the central nervous system is progressively depressing. The respiration and heart are slightly affected by a small dose, but continuous small doses produce hypnotic effects. Alcohol causes vasodilation, resulting in a warm, flushed skin and a feeling of surface warmth, but it lowers the body temperature. When large amounts are ingested, the fall in temperature is very pronounced. High concentrations of alcohol injure the kidney epithelium.

Alcohol is a hydrocarbon and is oxidized in the body, yielding energy, so it may be considered a food. It cannot be stored or utilized to build tissue, but by yielding energy it lessens consumption of other foodstuffs and, encourages storage, and therefore chronic alcoholics show signs of malnutrition.

Local uses:

1. As a sponge bath in fevers.
2. As a rubefacient and counterirritant.
3. As a local anesthetic, injected in or near the nerves to allay pain, as in spasmodic facial neuralgia or sciatica.
4. As an antiseptic, applied externally in 70 percent strength.

Systemic uses:

1. In treatment of insomnia, in the form of whiskey, brandy, or wine.
2. As a digestive stimulant.
3. As a hypnotic.

Toxicology.—Acute alcohol intoxication. The symptoms are stupor or coma, cold clammy skin, low body temperature, slow respiration, normal or dilated pupils, accelerated heart rate. Death is rare, unless coma persists for more than 12 hours.

Treatment

1. Gastric lavage.
2. Warmth.
3. Stimulants.
4. Symptomatic measures.

Toxicology.—Chronic alcoholism. The symptoms vary, including gastroenteritis, dilation of the skin capillaries, particularly those of the face, loss of weight, malnutrition, personality changes, delirium tremens, mental and moral deterioration, alcoholic cirrhosis, pellagra, and serious organic disorders.

The patient should be hospitalized for treatment.

Brandy.

Whiskey.

Sherry Wine.

OPIUM AND ITS ALKALOIDS

Opium.—Opium (Gum Opium).

Action.—Morphine is the most important of the alkaloids of opium. It is a narcotic, depressing cerebral activity and producing analgesia and sleep. It is a respiratory depressant. Small doses dull the cough reflex and larger doses abolish it. It often relieves dyspnea. This drug stimulates the spinal cord and medullary vomiting center and is therefore never used as a sedative in strychnine poisoning or other convulsive states. It constricts the pupils. It causes constipation by diminishing the secretions of the gastrointestinal tract and increasing the tone of the intestinal musculature to the point of spasm.

Morphine stimulates other smooth muscles to contraction. It has little effect on the cardiovascular system, but therapeutic amounts of morphine relax the cutaneous blood vessels, causing flushing, itching, sweating, and sneezing.

Opium is less depressant to respiration than morphine because of the stimulating effect of narcotine and papaverine. It is more constipating than morphine, probably because of the depressant effect of papaverine on the smooth muscles of the intestines. It is more likely to cause nausea because of its irritant action on the gastric mucosa.

Uses of the opiates:

1. As analgesics. For this purpose, morphine is preferred to the whole drug.
2. As cough sedatives in bronchitis.
3. In the treatment of certain types of diarrhea, preparations of the whole drug being preferred to morphine.
4. As diaphoretics, usually in the form of Dover's powder.
5. To allay vomiting, especially of reflex origin.
6. As hypnotics.

Toxicology.—The symptoms are deep sleep or coma, depressed respiration, pupils symmetrical and contracted, cyanosis, suppressed urine, low body temperature, and cold, clammy skin. The blood pressure may fall to shock level. There may be skin rashes and pruritis. Before depression,

the patient may become restless and delirious and vomiting may occur. Death is usually due to respiratory failure.

Treatment

1. Gastric lavage with potassium permanganate or iodine solution well diluted.

2. Magnesium sulfate solution should be left in the stomach after lavage to act as a cathartic.

3. Respiratory stimulants, such as caffeine, ephedrine, coramine, or atropine may be used.

4. Only one dose not to exceed 1.5 mg. of atropine should be administered.

5. The kidneys should be kept functioning as they are the main agent of elimination of the poison.

6. The patient should be kept awake and moving if possible.

7. Treated symptomatically.

Opium and morphine are extremely habit forming. This is one of the most difficult to overcome and produces serious effects on the physical and moral condition of its victims. Their sale is strictly regulated in the United States and most other countries.

Powdered Opium.—Dose: 60 mg. (1 grain).

Opium Tincture—(Laudanum).—Dose: 0.6 cc. (10 min.).

Camphorated Opium Tincture—(Paregoric).—Dose: 4.0 cc. (1 fluidrachm).

Opium Extract.—Dose: 30 mg. ($\frac{1}{2}$ grain).

Compound Opium and Glycyrrhiza Mixture—(Brown Mixture).—Dose: 4.0 cc. (1 fluidrachm).

Ipecac and Opium Powder—(Dover's Powder).—Dose: 0.3 gm. (5 grains).

Morphine Sulfate—Morphinae Sulfas.—Dose: 10 mg. ($\frac{1}{8}$ grain).

Morphine Hydrochloride.—Dose: 8 mg. ($\frac{1}{8}$ grain).

Morphine Injection.—Dose of the morphine salt: 10 mg. ($\frac{1}{8}$ grain).

Morphine and Atropine Sulfates Tablets.—Dose: morphine sulfate, 15 mg. ($\frac{1}{4}$ grain); atropine sulfate, 0.4 mg. ($\frac{1}{50}$ grain).

Morphine Sulfate Tablets.—Dose of morphine sulfate: 10 mg. ($\frac{1}{4}$ grain).

Codeine.—Codeine resembles morphine in action but has about one-sixth of the analgesic power and about one-fourth of the respiratory depressant effect of morphine. It has the same therapeutic uses. Dose: 30 mg. ($\frac{1}{2}$ grain).

Codeine Phosphate—Codeinae Phosphas.—Dose: 30 mg. ($\frac{1}{2}$ grain).

Codeine Phosphate Tablets.—Dose: 30 mg. ($\frac{1}{2}$ grain).

Codeine Sulfate—Codeinae Sulfas.—Dose: 30 mg. ($\frac{1}{2}$ grain).

Codeine Sulphate Tablets.—Dose: 30 mg. ($\frac{1}{2}$ grain).

Ethylmorphine Hydrochloride—Aethylmorphinae Hydrochloridum (Dionin).—It is prepared synthetically from morphine. It has more analgesic and hypnotic power than codeine but less than morphine.

It is used as a cough sedative and analgesic, and as a lymphagogue in various inflammations of the eye and nose because of its irritating effect on the mucous membrane. Dose: 15 mg. ($\frac{1}{4}$ grain).

Dihydromorphinone Hydrochloride—Dihydramorphinoni Hydrochloridum (Dilaudid).—The action is similar to that of morphine, but it is about 10 times more analgesic and five times more hypnotic. It causes less nausea, vomiting, and constipation than morphine. It is used as an analgesic and cough sedative. Dose: 2 mg. ($\frac{1}{50}$ grain).

Dihydromorphinone Hydrochloride Injection.—Dose: 2 mg. ($\frac{1}{50}$ grain).

Dihydromorphinone Hydrochloride Tablets.—Dose: 2 mg. ($\frac{1}{50}$ grain).

Meperidine Hydrochloride—(Demerol Hydrochloride).—It is prepared synthetically. Chemically it is not related to the opium alkaloids. A white crystalline powder, soluble in water.

Action.—Is similar to a combination of morphine and atropine, although its action is milder than that of morphine. Dose: intramuscular, 0.1 gm. ($1\frac{1}{2}$ grains).

Meperidine Hydrochloride Injection.—Dose: 0.1 gm. ($1\frac{1}{2}$ grains).

Meperidine Hydrochloride Tablets.—Dose: 0.1 gm. (1½ grains).

ANTISPASMODICS

These relax smooth or skeletal muscle. They include curare and papaverine preparations.

Tubocurarine Chloride.

Action.—In small doses it blocks the nerve muscle transmission of nerve impulses to skeletal muscle. Larger doses depress ganglionic transmissions in the autonomic nervous system. It is used in a number of conditions to reduce the tone of contractile skeletal muscle.

Tubocurarine Chloride Injection.

Papaverine Hydrochloride.—Papaverinae Hydrochloridum.

Action.—Papaverine differs from other official opium alkaloids in that it produces very little effect on the central nervous system. In therapeutic doses it does not cause analgesia or sleep. It relaxes many smooth muscles, particularly those of the blood vessels, bronchi, gastrointestinal tract, ureter, and biliary system.

Papaverine is used in the treatment of peripheral or pulmonary arterial embolism, in threatened gangrene, and in certain other forms of peripheral vascular disease. It is also used to relax spasms of the bronchi or the gastrointestinal and genitourinary tracts. Dose: oral or intravenous, 0.1 gm. (1½ grains).

Papaverine Hydrochloride Injection.—Dose: 0.1 gm. (1½ grains).

AUTONOMIC DRUGS

The autonomic nervous system, also called the vegetative, visceral, or involuntary nervous system, controls the automatic functions of the body. It consists of nerves, ganglia, and plexuses which innervate the heart, blood vessels, glands, viscera, and smooth muscles. It is divided into the sympathetic and parasympathetic nervous systems.

The sympathetic nerves, when stimulated, usually dis-

charge as a unit, and the effects can be noticed under circumstances of fright or rage. The heart is accelerated, the blood pressure rises, the spleen discharges red cells into the blood, the blood sugar rises, and the pupils dilate. Hence the body is better prepared to fight.

The parasympathetic nerves do not all discharge at once. They are concerned with the functions of conservation and restoration rather than expenditure of energy. They slow the heart, lower the blood pressure, stimulate gastrointestinal movements and secretions, aid absorption, contract the pupils, and empty the bladder and rectum.

Chemical Mediation of Nerve Impulses.—The theory to-day is that nerve impulses effect responses in muscles and glands by liberating a chemical substance which acts as the major local exciting agent. Upon stimulation, the parasympathetic nerves release at their peripheral endings a chemical called acetylcholine. This substance is probably present in the tissues in a physiologically inactive form, and the nerve impulses change it to an active state in which it can be destroyed by cholinesterase. Cholinesterase is an enzyme, present in blood and tissues, which splits acetylcholine into choline, a physiologically weak substance, and acetic acid. The cholinesterase appears to act as a check on the action of the acetylcholine. It is usually present in tissues where acetylcholine is liberated by nerve impulses.

Upon stimulation of the sympathetic nerves, a substance similar to epinephrine, called sympathin, is liberated. It exists in two forms, sympathin E, an excitor, and sympathin I, an inhibitor.

The parasympathetic nerves are sometimes referred to as the cholinergic nerves and the sympathetic nerves as the adrenergic nerves.

The autonomic drugs are drugs which act on structures innervated by the autonomic nerves, either stimulating or depressing the effector cells. They do not affect the nerve endings, so they cannot be called autonomic nerve depressants or stimulants. They will be discussed under various groups.

PARASYMPATHOMIMETIC DRUGS

These are drugs which stimulate the structures which are innervated by the parasympathetic nerves and produce effects similar to those produced by stimulation of the nerves.

CHOLINE ESTERS

Acetylcholine.—This is not an official drug, but it will be discussed here because of its relationship to the other choline esters.

Action.—In therapeutic doses it produces little change in cardiovascular activity except for a vasodilation and slight fall in blood pressure. Large doses given intravenously may cause flushing and warmth of the skin, throbbing in the head, palpitation, bounding pulse, and profuse sweating. Large doses increase peristalsis and the gastrointestinal secretions. Glands innervated by the cholinergic nerves, particularly the salivary, lacrimal, and sweat glands, are stimulated by acetylcholine. It also causes bronchoconstriction and increased secretion of the bronchial glands.

Methacholine Chloride.—Methacholinae Chloridum (Mecholyl, Mecholyn, Acetyl-betamethylcholine Chloride).

Action.—Methacholine is similar in action to acetylcholine, but it is less rapidly inactivated by cholinesterase and shows a selective action for certain effector cells. It is about 200 times as potent as acetylcholine in producing cardiac responses. It is used in the treatment of auricular paroxysmal tachycardia and of abdominal distention due to postoperative intestinal ileus, anesthesia, acute infectious diseases, and sometimes in urinary retention. It is used orally in treatment of atonic constipation. Methacholine is a physiological antidote in atropine poisoning. It is effective in the relief of vasospasm and pain in peripheral vascular disease and in the treatment of indolent and gangrenous ulcers due to this disease. Dose: oral, 0.2 gm. (3 grains); subcutaneous, 10 mg. ($\frac{1}{8}$ grain).

Methacholine Chloride Capsules.—Dose of methacholine chloride: 0.2 gm. (3 grains).

Methacholine Chloride Injection.—Dose of methacholine chloride: subcutaneous, 10 mg. ($\frac{1}{4}$ grain).

Carbachol.—(Carbamylcholine Chloride).

Action.—Carbachol differs from methacholine in that it is not destroyed by cholinesterase; it has greater action on the gastrointestinal tract and urinary bladder but less on the heart. It is the most potent and toxic of the known derivatives of choline. Atropine is less effective in antagonizing its action than that of methacholine and acetylcholine.

It is used to relieve urinary retention following labor, accompanying certain types of spinal lesion, or in postoperative cases, and in the treatment of abdominal distention due to postoperative intestinal ileus. It is also used in the treatment of auricular paroxysmal tachycardia and for the relief of acute pain due to vasospasm in peripheral vascular disease. Dose: oral, 2 mg. ($\frac{1}{50}$ grain); subcutaneous, 0.25 mg. ($\frac{1}{250}$ grain).

Carbachol Injection.—Dose of carbachol: subcutaneous, 0.25 mg. ($\frac{1}{250}$ grain).

Carbachol Tablets.—Dose of carbachol: 2 mg. ($\frac{1}{50}$ grain).

Pilocarpine Nitrate.—Pilocarpinae Nitras.

Action.—Pilocarpine stimulates the smooth muscle and gland cells innervated by cholinergic nerves, especially the sweat and salivary glands. It also produces myosis and such other effects as stimulation of the smooth muscles of the intestinal tract, increase in tone and motility of the ureters, urinary bladder, gall bladder, and biliary ducts, and constriction of the bronchioles, which are undesirable and not therapeutically important, although they have some toxicologic importance.

It is used as a myotic in the treatment of glaucoma and other eye diseases, after mydriasis, occasionally as a diaphoretic in the treatment of edema, and as a sialogogue. It is sometimes incorporated in cough mixture as an expectorant. It is a physiological antidote in atropine poisoning. Dose: 5 mg. ($\frac{1}{2}$ grain).

Toxicology.—The symptoms appear quickly after ingestion of the drug and soon reach their peak. The first to be noted are intestinal disturbances, violent peristalsis, colic, and

persistent purging. There is nausea and vomiting, fibrillary twitching of the muscles all over the body, contraction of the pupils to pin-point size, blurred vision, marked sweating, salivation, lacrimation, dyspnea, increased pulmonary secretions, urinary urgency, difficulty in voiding, pale skin bathed in cold perspiration, rapid cardiac rate, weak pulse, and blood pressure at shock level. Death may be due to pulmonary or central respiratory paralysis.

Treatment

1. Atropine sulfate hypodermically or intravenously as the physiological antidote.
2. Followed by symptomatic treatment.

Pilocarpine Hydrochloride.

INHIBITORS OF CHOLINESTERASE

Physostigmine Salicylate.—Physostigminae Salicylas (Eserine Salicylate).

Action.—Physostigmine acts by inhibiting cholinesterase from inactivating acetylcholine, permitting the acetylcholine to exert all its characteristic actions in an intensified manner. Its more important therapeutic effects are on the pupil of the eye and the intestinal and skeletal muscles. Other responses are of toxicologic interest. It is used as a myotic, particularly in the treatment of glaucoma and after mydriasis. It is also employed in the treatment of abdominal distention due to postoperative intestinal ileus. It is a depressant to the motor side of the spinal cord and is therefore used as a physiological antidote in strychnine poisoning. Dose: 2 mg. ($\frac{1}{30}$ grain).

Toxicology.—Symptoms and treatment are the same as for poisoning by pilocarpine.

Neostigmine Bromide.—Neostigminae Bromidum (Prostigmine Bromide).

Action.—Neostigmine acts like physostigmine by inhibiting cholinesterase. It is used like physostigmine for the relief of abdominal distention and in treatment of atony of the urinary bladder. It does not produce myosis, fall in

blood pressure, uneven pulse, or bronchospasm. Dose: 15 mg. ($\frac{1}{4}$ grain).

Neostigmine Bromide Tablets.—Dose of neostigmine bromide: 15 mg. ($\frac{1}{4}$ grain).

Neostigmine Methylsulfate—Neostigminae Methylsulfas (Prostigmine Methylsulfate).—It is used for the same purposes as neostigmine bromide, but it is administered parenterally. Dose: subcutaneous or intramuscular, 0.5 mg. ($\frac{1}{20}$ grain).

Neostigmine Methylsulfate Injection.—Dose of neostigmine methylsulfate: subcutaneous or intramuscular, 0.5 mg. ($\frac{1}{20}$ grain).

SYMPATHOMIMETIC DRUGS

These drugs stimulate the structures innervated by the sympathetic or adrenergic nerves, producing an effect similar to that caused by stimulation of the adrenergic nerves.

Epinephrine—Epinephrine (Adrenalin, Suprarenalin).—Epinephrine is usually employed in the form of hydrochloride in solution.

Action.—Its most important actions are on the heart and blood vessels. It accelerates the heart rate, increases the cardiac output, and alters the cardiac rhythm. It constricts the blood vessels in some areas and dilates them in others. The vessels of the skin and mucosa are constricted after local application or injection of the drug, while those of the skeletal muscles are dilated by injection. An intravenous injection produces an almost immediate rise in blood pressure. Epinephrine is not a respiratory stimulant. It is a metabolic stimulant and tends to increase the basal metabolism rate. It relaxes the bronchial musculature and the muscles of the gastrointestinal tract and urinary bladder. Applied locally to the eye, it has a mydriatic effect on some patients.

Epinephrine is used to control hemorrhage from minor cuts, but it is not effective if a vein or artery is involved. It relieves nasal congestion by vasoconstriction, but this effect is of short duration. It is used in conjunction with

local anesthetics to prolong their action and lessen the possibility of hemorrhage and is given during spinal anesthesia to maintain blood pressure. It is valuable in the treatment of acute cardiac failure and in the resuscitation of cardiac arrest. It is often used in the treatment of bronchial asthma, in the form of the injection or inhalation. It is also employed for the relief of certain allergic disorders such as hives, urticaria, serum reactions, and hay fever. Dose: subcutaneous or intramuscular, 1 mg. ($\frac{1}{100}$ grain).

Epinephrine Inhalation.—(Epinephrine Solution, 1:100).

Epinephrine Injection.—(Epinephrine Hydrochloride Injection).—Dose of epinephrine: subcutaneous or intramuscular, 1 mg. ($\frac{1}{100}$ grain).

Epinephrine Solution.—(Epinephrine Solution, 1:1,000).

Epinephrine in Oil Injection.—Dose: 2 mg. ($\frac{1}{50}$ grain).

Phenylephrine Hydrochloride.—(Neo-Synephrine Hydrochloride).

Action.—It has a vasopressor action when injected or taken orally. When applied locally to mucous membrane, it acts as a vasoconstrictor and reduces swelling and congestion. It is often combined with local anesthetics in much the same way as epinephrine hydrochloride.

Phenylephrine Hydrochloride Injection.

Phenylephrine Hydrochloride Solution.

Ephedrine.—Ephedrina.

Action.—Ephedrine is similar in action to epinephrine but differs from it in many ways. It is more stable and can be given by mouth, and its action lasts longer. It stimulates the central nervous system and respiration. Its constrictor effects are less marked, but it does not produce any after-congestion. However, if used too often it may lose its effectiveness. It has a better mydriatic effect than epinephrine.

Ephedrine is used in the form of spray or nose drops for the relief of nasal congestion and bronchial asthma. It is effective in the treatment of certain allergic disorders, such as hay fever or hives. It is given with spinal anesthesia to maintain blood pressure. It is used as a mydriatic in ophthalmology because it has no cycloplegic effect. It is

occasionally employed to allay motion sickness and in the treatment of narcolepsy.

Ephedrine Hydrochloride.—Dose: 25 mg. ($\frac{3}{8}$ grain).

Ephedrine Hydrochloride Capsules.—Dose: 25 mg. ($\frac{3}{8}$ grain).

Ephedrine Hydrochloride Tablets.—Dose: 25 mg. ($\frac{3}{8}$ grain).

Ephedrine Sulfate.—Dose: 25 mg. ($\frac{3}{8}$ grain).

Ephedrine Sulfate Capsules.—Dose: 25 mg. ($\frac{3}{8}$ grain).

Ephedrine Sulfate Tablets.—Dose: 25 mg. ($\frac{3}{8}$ grain).

Ephedrine Sulfate and Phenobarbital Capsules.—Dose: 25 mg. ($\frac{3}{8}$ grain) of ephedrine sulfate; 30 mg. ($\frac{1}{2}$ grain) of phenobarbital.

Ephedrine Sulfate Jelly.—1 percent.

Ephedrine Sulfate Solution.—3 percent.

Ephedrine Sulfate Injection.—Dose: 25 mg. ($\frac{3}{8}$ grain).

Ephedrine Sulfate Syrup.—Dose: 4 cc. (1 fluidrachm).

Ephedrine Spray.—1 percent.

Compound Ephedrine Spray.—1 percent.

Racephedrine Hydrochloride.—Dose: 25 mg. ($\frac{3}{8}$ grain).

Racephedrine Hydrochloride Capsules.—Dose: 25 mg. ($\frac{3}{8}$ grain).

Racephedrine Hydrochloride Solution.—1 percent.

Amphetamine.—(Racemic Amphetamine).

Action.—Amphetamine produces local effects similar to ephedrine. On inhalation there is shrinking of the nasal mucosa. It is used in head colds, sinusitis, hay fever, and asthma. Its use is contraindicated in cases of cardiovascular disease.

Amphetamine Inhalant.—This in an inhaler containing aromatic amphetamine.

Amphetamine Sulfate.

Action.—Amphetamine sulfate is a central nervous system stimulant, tending to abolish fatigue and mental depression. Its effects on the higher nerve centers is so pronounced that it is rarely used for any other action. It is used in the treatment of narcolepsy, mental depression treatment of alcoholism, and as an appetite depressant in control of obesity.

Toxicology.—Amphetamine sulfate may, in certain instances, produce overstimulation, restlessness, sleeplessness, gastrointestinal disturbance, chills, and collapse. Caution should be exercised in administering this drug to patients suffering from hypertension or cardiovascular disease. Dose: 5 mg. ($\frac{1}{2}$ grain).

Amphetamine Sulfate Tablets—(Benzedrine Sulfate Tablets).—Dose: 5 mg. ($\frac{1}{2}$ grain).

Methamphetamine Hydrochloride.—(Desoxyephedrine).

Action.—Similar to amphetamine sulfate in uses. It is believed to be more powerful as a stimulant but less active on the cardiovascular system. Dose: 5 mg. ($\frac{1}{2}$ grain).

HISTAMINE ANTAGONIZING AGENTS

Histamine has been demonstrated to have an important role in allergic reactions. This fact has led to the development of compounds that oppose it.

Diphenhydramine Hydrochloride.

Action.—It has the ability to antagonize the pharmacologic effects of histamine. It reduces the bronchoconstriction produced by histamine. It is used in the symptomatic treatment of urticaria, allergic rhinitis, serum reactions, and other allergic conditions. It will sometimes relieve the itching of infantile eczema. The principal side reaction is the production of sleep. Dose: 50 mg. ($\frac{3}{4}$ grain).

Diphenhydramine Hydrochloride Capsules—(Benadryl).—Dose: 50 mg. ($\frac{3}{4}$ grain).

Tripelennamine Hydrochloride.—A white crystalline powder. The incidence of side reactions is low. Dose: 50 mg. ($\frac{3}{4}$ grain).

Tripelennamine Hydrochloride Tablets—(Pyribenzamine).—Dose: 50 mg. ($\frac{3}{4}$ grain).

AUTONOMIC BLOCKING AGENTS

These drugs block many of the responses to cholinergic or adrenergic nerve stimulation by inhibiting the effector cells.

Cholinergic Nerve Blocking Agents

Atropine.—(Atropina).

Action.—Atropine has two major actions:

1. On the central nervous system. It stimulates the medulla and higher centers and causes an increase in respiration.

2. On the smooth muscles and the secretory glands. It relaxes the muscles of the intestinal tract, bronchi, ureter, biliary ducts, and gallbladder. It inhibits glandular secretions, causing dryness of the nose, throat, bronchi, mouth, and skin.

Atropine has a mydriatic effect on the pupil of the eye and also causes a paralysis of accommodation. Large doses increase the cardiac rate. It causes dilation of the cutaneous blood vessels, producing a scarlet flush. It may also cause a slight rise in body temperature. It has a dulling effect on the sensory nerve endings and is often used as an anodyne.

Atropine is used as a mydriatic and cycloplegic in ophthalmology, as an anhidrotic, in large doses as a circulatory stimulant, and as a respiratory stimulant in certain poisonings. It is a physiological antidote for eserine, prostigmine, pilocarpine, and muscarine. It is used to relax spasms of the intestinal tract and also those of the bronchi in bronchial asthma. It is given with morphine to overcome its respiratory depressant effects. Dose: 0.4 mg. ($\frac{1}{150}$ grain).

Toxicology.—Symptoms are warmth and dryness of the mouth, difficulty in swallowing and talking, mydriasis, blurred vision, intolerance of light, hot dry skin, a rash resembling that of scarlet fever on the face, neck, and upper body, a rise in body temperature, rapid cardiac rate, weak pulse, elevated blood pressure, giddiness, muscular incoordination, confusion, often hallucinations, delirium, or mania. These symptoms may persist for several hours. Death is due to respiratory failure.

Treatment

1. Gastric lavage with a chemical antidote, pilocarpine as a physiological antidote.

2. Symptomatic treatment.

Atropine Sulfate.—Dose: 0.5 mg. ($\frac{1}{20}$ grain).

Atropine Sulfate Tablets.—Dose: 0.5 mg. ($\frac{1}{20}$ grain).

Scopolamine Hydrobromide.—Scopolaminae Hydrobromidum (Hyoscine Hydrobromide).

Action.—Scopolamine differs from atropine in its action on the central nervous system. Atropine may first stimulate and then depress the brain, but scopolamine is primarily a depressant, and therapeutic doses will cause drowsiness, fatigue, and sleep. Its actions on the eye, heart, intestines, and bronchi are similar to those of atropine but more pronounced and prolonged. It has a stimulating effect on respiration.

It is used as a sedative in delirium tremens, maniacal states, cardiac and hyperthyroid psychoses, and to quiet nervous unrest, particularly in the withdrawal treatment of opium and alcohol. It is useful in ophthalmology as a mydriatic of short duration. It is frequently used with morphine as a respiratory stimulant. Dose: 0.6 mg. ($\frac{1}{100}$ grain).

Toxicology.—The symptoms and treatment are the same as in atropine poisoning.

Scopolamine Hydrobromide Tablets.—Dose: 0.6 mg. ($\frac{1}{100}$ grain).

Homatropine Hydrobromide.—Homatropinae Hydrobromidum.—A white crystalline powder, affected by light, soluble in 6 parts water and 40 parts alcohol. It is a synthetic alkaloid.

Homatropine is less active and toxic than atropine. Its only use is in ophthalmology as a mydriatic, in 1 or 2 percent solution. It is preferable to atropine because its effect is of short duration.

Homatropine Methylbromide.—Dose: 2.5 mg. ($\frac{1}{25}$ grain).

Homatropine Methylbromide Tablets.—Dose: 2.5 mg. ($\frac{1}{25}$ grain).

Belladonna Leaf.—Belladonnae Folium (Deadly Nightshade Leaf).—The activity of the drug resides in the tropine, and its therapeutic uses are the same as those of the alkaloid.

Belladonna Tincture.—Dose: 0.6 cc. (10 min.).

Hyoscyamus—Hyoscyamus (Henbane).—Hyoscyamus resembles belladonna in action and uses. However, the presence of a larger proportion of scopolamine makes it a central depressant. Its important use is in the relief of painful spasms of the unstriated muscle, as in irritable bladders. Dose: 0.2 gm. (3 grains).

Stramonium—Stramonium (Jimson Weed, Jamestown Weed).—Stramonium yields about 0.25 percent alkaloids, the most important of which are atropine, hyoscyamine, and scopolamine. It is similar in action to belladonna and is occasionally employed in its place. It is more frequently used in the treatment of asthma, usually by smoking the leaves.

Adrenergic Nerve Blocking Agents

Ergotamine Tartrate—Ergotaminae Tartras (Gynergen).

Action.—Ergotamine specifically blocks the effects of stimulation of adrenergic nerves. It also prevents response to epinephrine stimulation. It does not prevent the release of the chemical mediator or the formation of sympathin E and I. In therapeutic doses it has only a slight and irregular blocking effect. Large doses cause vasoconstriction and increase in blood pressure. Ergotamine has a variable action on the central nervous system. Small doses increase respiration.

Ergotamine Tartrate is a valuable drug for relieving migraine headache. It increases the motor activity of the uterus but is less efficient than ergonovine and is seldom used as a uterine stimulant. Dose: intramuscular, 0.5 mg. ($\frac{1}{120}$ grain); oral, 1 mg. ($\frac{1}{60}$ grain).

Toxicology.—This will be discussed under ergot.

Ergotamine Tartrate Tablets.—Dose: 1 mg. ($\frac{1}{60}$ grain).

Ergotamine Tartrate Injection.—Dose: 0.5 mg. ($\frac{1}{120}$ grain).

OXYTOCICS

Oxytocics or ecbolics are drugs which produce a rhythmic contraction of the uterus. Their action is selective for the uterus, although other smooth muscles are affected. The

most important oxytocics are the alkaloids of ergot, ergonovine and ergotamine; oxytocin, the oxytocic principle extracted from posterior pituitary; and quinine.

Ergot.—Ergota (Rye Ergot, Rye Smut).

Action.—The active principles are ergotamine, ergotoxine, and ergonovine. Ergotamine and ergotoxine are similar in their pharmacological actions. They have a stimulating effect on the uterus. They increase the blood pressure by constriction of the smaller blood vessels and may damage the capillary endothelium, causing vascular stasis, thrombosis, and gangrene. They also slow the heart. Ergonovine also stimulates the uterus, but its action is more rapid. The response after intravenous injection is almost immediate, and after oral administration it takes place in a few minutes. For this reason it is preferred as an oxytocic. Ergonovine is readily absorbed from the intestinal tract.

Ergot is undependable in action and subject to deterioration, so its clinical use has decreased since the discovery of ergonovine.

Toxicology.—In acute poisoning, the symptoms consist of paleness and coldness of the skin, partial paralysis with numbness and tingling sensation of limbs, feeble pulse, and possible abortion in pregnancy. In chronic poisoning, which may occur by ingestion of rye infected with ergot, the symptoms are gangrene in the extremities, increased rapidity or slowing of heart action, high or low blood pressure, headache, nausea, vomiting, diarrhea, and sometimes blindness. The treatment is symptomatic.

Ergonovine Maleate—Ergonovinae Maleas (Ergometrine Maleate, Ergotrate).—It is used as an oxytocic. Dose: intravenous or intramuscular, 0.2 mg. ($\frac{1}{500}$ grain); oral, 0.5 mg. ($\frac{1}{120}$ grain).

Ergonovine Maleate Injection.—Dose: 0.2 mg. ($\frac{1}{500}$ grain).

Ergonovine Maleate Tablets.—Dose: 0.5 mg. ($\frac{1}{120}$ grain).

ANALGESICS AND ANTIPYRETICS

Analgesics are drugs which are used to relieve pain without producing loss of consciousness. Some drugs of this general

class were first used as antipyretics and are sometimes called antipyretic analgesics.

Salicylates

Action.—The salicylates are antipyretics and analgesics. They lower the temperature rapidly in febrile patients but rarely affect normal body temperature. This is true of most antipyretics. As analgesics the salicylates are less effective than morphine. Therapeutic doses have no important cardiovascular action. Large doses may relax the smooth muscles, particularly the peripheral blood vessels. Toxic doses may depress circulation by vasomotor paralysis. The heart is not affected except in very large doses. Salicylates may irritate the gastrointestinal tract and cause epigastric distress, nausea, and vomiting. Therapeutic doses increase the urinary excretion of uric acid.

Salicylates relieve pain in headache, myalgia, arthralgia, and similar conditions. In acute rheumatic fever and gout they reduce the pain, immobility, swelling and inflammation of the joints.

Toxicology.—The symptoms of mild salicylate poisoning, sometimes called salicylism, are headache, visual and auditory disturbances, dizziness, sweating, thirst, gastrointestinal disturbances, and sometimes skin rashes with excessive itching. Large doses may cause dyspnea. As the poisoning progresses, cardiovascular collapse and respiratory failure may ensue. The treatment is symptomatic. Some patients have an idiosyncrasy to salicylates, usually manifested by skin rashes.

Miscellaneous Analgesics

Cinchophen.—Cinchophenum (Phenylcinchoninic Acid, Atophan).

Action.—Cinchophen resembles the salicylates in its pharmacological actions. It is used as an analgesic, antipyretic, antirheumatic, and in the treatment of gout. Excessive use injures the liver, causing hepatitis and cirrhosis. Its toxic effects are unpredictable. Most authorities agree

that there is no safe way to administer Cinchophen. Dose: 0.5 gm. (7½ grains).

Cinchophen Tablets.—Dose: 0.5 gm. (7½ grains).

Neocinchophen—Neocinchophenum.—Neocinchophen resembles cinchophen in actions and uses but is less irritating to the stomach. Dose: 0.3 gm. (5 grains).

Neocinchophen Tablets.—Dose: 0.3 gm. (5 grains).

Colchicine—Colchicina.—Colchicine is used in treatment of gout. In some cases the pain, swelling, and redness are relieved in a few hours, but many patients do not respond. Dose: 0.5 mg. (⅓₁₀ grain).

Toxicology.—The symptoms of poisoning are excessive nausea, vomiting, abdominal pains, purging, straining, thirst, weak pulse, cold extremities, general prostration, headache, delirium, stupor, muscular depression, and bloody urine.

Treatment

1. Gastric lavage.
2. Symptomatic therapy.

Coal Tar Analgesics

The two classes studied will be the para-aminophenol derivatives, as acetanilid and acetophenetidin, and the pyrozalin derivatives, as antipyrine and aminopyrine.

Both groups resemble the salicylates in action but differ from them in chemical structure. The para-aminophenol group are derivatives of aniline. In the body they are changed to para-aminophenol and exert their characteristic action.

Toxicology.—Para-aminophenol group. The most outstanding characteristic of acetanilid poisoning is cyanosis. Phenacetin causes this symptom less frequently. Other symptoms are difficulty in breathing, vertigo, weakness, and anginal pain. More severe cases are marked by subnormal temperature; shallow, rapid respiration; rapid, weak, irregular pulse; vasodilation and vascular collapse, followed by shock; circulatory failure. In some cases skin rashes appear, accompanied by fever. The central nervous system may be stimulated, producing excitement and delirium.

Treatment

1. Gastric lavage, followed by symptomatic treatment, such as artificial respiration.
2. Blood transfusion.
3. Shock treatment.

These drugs have a cumulative effect and are capable of causing chronic poisoning. Diagnosis is difficult and can be confirmed only by the patient's statement as to their use. Symptoms are loss of weight, lack of appetite, digestive disturbances, insomnia, anemia, and cyanosis. The treatment consists of withdrawal of the drug and symptomatic treatment.

Toxicology.—Pyrozalin group. The symptoms are similar to those of acetanilid poisoning, except that cyanosis seldom occurs. Aminopyrine may cause leukopenia. The treatment is the same as for the para-aminophenol group.

Acetanilid—Acetanilidum (Antifebrin).—Dose: 0.2 gm. (3 grains).

Acetophenetidin Tablets.—Dose: 0.3 gm. (5 grains).

Antipyrine—Antipyrina (Phenazone).—In addition to being an analgesic, antipyrine has some anesthetic and vasoconstricting properties and is occasionally used in nose sprays. Dose: 0.3 gm. (5 grains).

Aminopyrine—Aminopyrina (Amidopyrine, Pyramidon).—Aminopyrine is classified as a dangerous drug and its sale except on prescription is prohibited by law. Dose: 0.3 gm. (5 grains).

GENERAL ANESTHETICS

General anesthesia is loss of sensation affecting the whole body. It is essential when complete unconsciousness and adequate muscular relaxation are desired, when movement of the patient may imperil the success of the operation, in lengthy operations, and in those where spinal anesthesia is not safe, as in thoracic surgery. The anesthetics which are administered by inhalation have the safety factor of being eliminated from the blood very rapidly. Being volatile, they are excreted quickly by the lungs.

Action.—The loss of sensation appears to be due to an effect on the spinal cord and appears before complete loss of consciousness. In sufficient doses, the anesthetics eventually paralyze the spinal cord, the cerebrum, the vital centers of the medulla, usually affecting first the respiratory and later the vasomotor mechanism.

The stages of anesthesia are:

1. *Analgesia*, in which the patient experiences a feeling of warmth all over his body, possible suffocation, local irritation of the eyes, sensation gradually becoming dulled and abnormal. Analgesia gradually ensues and pain is abolished. The skin of the face and neck is flushed. The pupils dilate as the patient passes into the second stage.

2. *Delirium or Excitement*, accompanied by marked involuntary motor activity. The pulse is accelerated, respiration hurried and often irregular, the skin flushed, warm, and moist. The pupils may be somewhat dilated but contract readily to light.

3. *Surgical Anesthesia*, in which there is a complete loss of sensation, with unconsciousness. The patient is in a deep stupor from which he cannot be aroused. Most of the reflexes are abolished, although certain ones, as the conjunctival and respiratory, may be retained. The muscles are relaxed but keep their tone. Respiration is full and regular. The pulse is usually full and blood pressure normal, but it starts to fall as the fourth stage approaches.

4. *Medullary Paralysis*, the stage of collapse and danger. The relaxation becomes more complete and there is often a loss of muscular tone, giving rise to danger signals such as stertorous respiration and changes in facial expression. The pulse is rapid and feeble, respirations shallow and far apart, the skin livid or pale, often a peculiar cyanotic pallor, the pupils widely dilated. All reflexes lost. Death may be due to respiratory failure, as with ether, or to cardiac failure, as with chloroform.

Ether.—Aether, $C_2H_5.O.C_2H_5$ (Ethyl ether).

Action.—Ether is a very popular anesthetic, although it has certain undesirable features, particularly its slowness of action and postoperative effect. It is a comparatively safe

anesthetic. There is some respiratory depression in the third stage but not a dangerous amount. Its depression of circulation is negligible compared with that of many other anesthetics.

Besides being a general anesthetic, ether is sometimes used in the form of the spirit as a carminative and remedy for hiccoughs.

Ether Spirit—(Hoffmann's Drops).—Dose: 4.0 cc. (1 fluidrachm).

Compound Ether Spirit—(Hoffmann's Anodyne).—Dose: 4.0 cc. (1 fluidrachm).

Chloroform—Chloroformum, CHCl_3 (Trichloromethane).—It is not inflammable, but its heated vapor burns with a green flame. It is soluble in 210 parts water and miscible with alcohol and ether in all proportions.

Caution.—Care should be taken not to vaporize chloroform near a naked flame because of the production of noxious gases.

Action.—As an anesthetic chloroform is much less disagreeable than ether, but in most cases it is decidedly more dangerous. It is more depressant to the heart and respiration, more harmful to the liver, and more irritating to the skin and mucous membrane, although it is less irritating to the respiratory tract. Since chloroform is less volatile than ether, it is used mostly in the warmer climates. It is more powerful than ether, requiring only one-eighth the amount of ether to produce anesthesia.

Chloroform is a powerful motor depressant in certain convulsions, such as those of strychnine poisoning. It is used internally as a carminative and occasionally as a sedative in cough mixtures. Externally it is used as a counter-irritant in the form of liniment.

Cyclopropane.—Cyclopropanum $(\text{CH}_2)_3$, (Trimethylene).

Caution.—Cyclopropane is inflammable and its mixtures with oxygen or air explode when ignited.

Action.—Cyclopropane was introduced in 1930 as a safe and potent anesthetic. Induction with this gas is pleasanter than with ether. There is no respiratory irritation and laryngospasm, and no respiratory depression with deep

surgical anesthesia. Blood pressure is little affected with anesthetic concentrations. The cardiac rate may be slowed during the surgical stage. Muscular relaxation is usually quite sufficient.

Administered expertly, cyclopropane can be used safely in almost every type of operation, including obstetrical surgery. Its use allows adequate oxygen throughout all depths of anesthesia, and there is a wide margin of safety between anesthetic and toxic concentrations. Because it is highly inflammable, caution must be observed in the use of the cautery or electric knife.

Vinyl Ether—Aether Vinylicus (Divinyl Oxide, Vine-thene).—Vinyl ether acts quickly and recovery is correspondingly rapid. It is used for anesthesia of short duration.

Ethyl Chloride—Aethylis Chloridum.—It is very inflammable and must not be used near a flame.

Ethyl chloride was originally used to produce local anesthesia by freezing because of the rapidity with which it evaporates from the skin. This form of anesthesia has several disadvantages. Dissection of frozen tissue is difficult, the process of thawing is painful, and freezing injures cells, lowers resistance to infection, and delays healing.

As a general anesthetic, ethyl chloride is used only for minor operations of short duration because of the rapidity of its action.

BASAL ANESTHETICS

Basal anesthesia is used as a basis for further and deeper anesthesia. It is produced by giving preanesthetic medication. It permits the patient to be brought to the operating room in an unconscious state but not sufficiently depressed for surgery.

Tribromoethanol—Tribromoethanol, $\text{Br}_3\text{C}.\text{CH}_2\text{OH}$ (Tribromomethyl Alcohol, Avertin).

Action.—Tribromoethanol has a depressant action on the central nervous system similar to that of chloroform. The patient often falls asleep in 5 to 15 minutes, and the maximum effect takes place in from 20 to 30 minutes. At the

end of an hour the anesthesia becomes lighter and consciousness is regained in about 2 to 3 hours. Postanesthetic recovery is usually pleasant.

Tribromoethanol is administered rectally and can be given to apprehensive patients without their knowledge. The official tribromoethanol solution is the form used. In proper doses it rarely causes serious respiratory effects. Dose: rectal, for each kilogram of body weight, 60 mg. (1 grain). The total amount administered should not exceed 8 gm. for women or 10 gm. for men, regardless of body weight.

Tribromoethanol Solution—(Bromethol).—Dose: rectal, for each kilogram of body weight, 0.06 cc. (1 min.), not to exceed 8 cc. for women and 10 cc. for men.

Amylene Hydrate—Amyleni Hydras, $C_2H_5.C(CH_3)_2.OH$ (Tertiary Amyl Alcohol).—Amylene hydrate has an effect similar to that of paraldehyde, but it is used only as a solvent for tribromoethanol.

LOCAL ANESTHETICS

Action.—The important action of this group of drugs is paralysis of the peripheral sensory nerves. They abolish all sensations, including taste and smell, although their chief effect is on the nerves of pain. Their effect is local, and they must be brought in contact with the nerve in effective concentration. Some must be injected in the area of the nerve, while others can penetrate the mucous membranes. For various surgical purposes they can be injected subcutaneously, producing anesthesia in a small area, into one of the larger nerve trunks to anesthetize a considerable area, or into the spinal canal producing an anesthesia suitable for operations on the abdomen or lower extremities. Epinephrine is frequently given with local anesthetics to constrict the blood vessels, thus prolonging the anesthesia and lessening hemorrhage.

Local anesthetics produce some undesirable effects. They stimulate the central nervous system, sometimes producing restlessness and tremors, followed by convulsions, and they may also produce circulatory stimulation or depression,

depending on the drug. Barbiturates may be used to counteract the central nervous system stimulation.

Cocaine.—Cocaina.

Action.—As a local anesthetic, cocaine is used only by topical application. It penetrates the mucous membrane rather readily. It is never administered by injection because it is a general protoplasmic poison.

Cocaine is a vasoconstrictor and mydriatic; its properties are not found in other local anesthetics. It is often used as a vasoconstrictor in the relief of nasal congestion. It is seldom used in the treatment of the eye because of its mydriatic effect and harmful action on the cornea, being replaced by certain synthetic drugs.

Toxicology.—Acute poisoning. The symptoms are quickened respiration and pulse rate, excitement, dilated pupils, dry throat, headache, vertigo, confusion, and clonic convulsions. The stimulation is succeeded by depression, and death may occur from respiratory failure.

The treatment consists of gastric lavage and symptomatic treatment with particular attention to respiration and circulation.

Toxicology.—Chronic poisoning. This is usually a result of addiction. The symptoms are emaciation, fainting spells, disorders of the circulatory system, febrile attacks, insomnia, mental failure, disagreeable hallucinations, possible delirium and acute mania, and moral degeneration.

The patient must be hospitalized and given specialized treatment. The victims of this habit show a marked tendency toward the commission of crimes of violence. The sale of cocaine is regulated by the Federal Narcotic Act.

Cocaine Hydrochloride.

Procaine Hydrochloride—Procainae Hydrochloridum (Procaine, Novocaine).—It produces a local anesthetic effect when placed on the tongue.

Action.—Procaine is administered only by injection. It is about one-fourth as toxic as cocaine when injected. It is used for infiltration anesthesia, nerve block, or spinal anesthesia, in doses of 100 to 150 mg. For nerve block, a 1 or 2 percent solution is usually employed.

Procaine Hydrochloride Injection.

Sterile Procaine Hydrochloride.

Procaine Hydrochloride Tablets.

Procaine Hydrochloride and Epinephrine Injection.

Procaine Borate.—Has the same action and uses as the hydrochloride.

Phenacaine Hydrochloride.—Phenacainae Hydrochloridum (Holocaine).

Toxicology.—Phenacaine is as toxic as cocaine when injected intravenously and twice as toxic when injected subcutaneously because it is not as readily destroyed in the body. It is not suitable for injection, and its use is limited to topical application. It is largely used as a local anesthetic in the eye, usually in 1 percent solution. It is one of the few synthetic local anesthetics which rival cocaine in ability to penetrate the mucous membrane.

Tetracaine Hydrochloride—Tetracainae Hydrochloridum (Amethocaine Hydrochloride, Pontocaine).—Slightly bitter taste followed by numbness.

Action.—Tetracaine hydrochloride is a local anesthetic with actions similar to those of procaine hydrochloride, but it is effective when applied to mucous membranes in lower concentrations. It is used for surface anesthesia in the eye, nose, and throat and in spinal anesthesia in which the anesthesia is prolonged.

Ethyl Aminobenzoate.—Aethylis Aminobenzoas, $C_6H_4.NH_2.CO.OC_2H_5$ (Benzocaine, Anesthesin).

Action.—Because of its low solubility, it is usually prescribed as a local anesthetic in the form of dusting powders for relief of pain in wounds, or in lozenges for throat irritations, or in ointment for itching in various skin diseases.

Ethyl Aminobenzoate Ointment.—5 percent.

Butacaine Sulfate—Butacainae Sulfas (Butyn Sulfate).—Butacaine sulfate is used for surface anesthesia in the form of a 2 percent solution for eye, nose and throat conditions.

Dibucaine Hydrochloride—Dibucainae Hydrochloridum (Nupercaine Hydrochloride).—It is used as a topical anesthetic on mucous membranes and for infiltration, and as a spinal and caudal anesthetic by injection.

Piperocaine Hydrochloride—(Metycaine Hydrochloride).—It is used topically for infiltration anesthesia, as a spinal anesthetic, and for caudal anesthesia.

ANTISEPTICS, GERMICIDES, FUNGICIDES, AND PARASITICIDES

The members of this group are chiefly employed by topical application for their local effect, but some are administered internally for their local action, as urinary or intestinal antiseptics.

Germicides kill all microorganisms, bactericides kill only bacteria, and antiseptics either kill or inhibit the growth of microorganisms.

Phenol.—Phenol, (C_6H_5OH) Carbolic Acid, Phenolic Acid, Phenolic Alcohol.

Action.—Locally, phenol is a general protoplasmic poison. In high concentration it precipitates protein. It is toxic to all types of cells. When applied to the skin it causes blanching, followed by sloughing of the tissue. It also has a local anesthetic effect. In adequate concentrations it is a fungicide and bactericide. The bactericidal efficiency is reduced by cold and alkaline media and is greater in aqueous solution than in glycerin or fats.

Phenol has a marked effect, first stimulating and then depressing, on the central nervous system, particularly on the spinal cord. The blood pressure is lowered and circulation is greatly depressed.

Phenol is occasionally used in disinfection of inanimate objects. Well diluted, it is employed as an antipruritic in lotions or ointments. Aqueous solutions stronger than 2 percent should not be used. Phenol is added as a preservative to preparations in ampuls. It is also used as a standard for comparison of disinfectant power. The term "Phenol Coefficient" is a number indicating the disinfectant value of a substance as compared with phenol.

Toxicology.—The symptoms are local corrosion of the tissue, accompanied by severe pain; vomiting, the vomitus having the odor of phenol; general capillary damage resulting

in low blood pressure; cold sweat, a marked fall in body temperature; scanty urine, containing albumin, casts and free hemoglobin, usually green to black in color; shock, soon followed by death from respiratory failure.

Treatment

1. Gastric lavage using olive oil, which dissolves the phenol and delays absorption.
2. Allow some olive oil to remain in the stomach to act as a diluent and demulcent.
3. Administer saline injections to promote diuresis and protect the kidneys.
4. Give other symptomatic treatment as necessary.
5. If phenol is spilled on the skin, it can be removed effectively with alcohol or castor oil.

Liquefied Phenol—(Liquefied Carbolic Acid, Liquid Phenol).—It contains 10 percent water.

Cresol—Cresol, $\text{CH}_3.\text{C}_6\text{H}_4.\text{OH}$.—Cresol is a mixture of orthocresol, metacresol, and paracresol. It is a much more powerful disinfectant than phenol. In the form of the official saponated solution of cresol, it is principally used for disinfecting inanimate objects. It is about as poisonous as phenol, and the symptoms and treatment are the same.

Betanaphthol—Betanaphthol (B-naphthol).

Action.—Betanaphthol is a powerful disinfectant, stronger than phenol. It is used locally in the treatment of parasitic skin diseases, usually in the form of ointments. Internally it is used as a vermifuge, especially for hookworm, and as an intestinal antiseptic, but it is not often prescribed for internal use because of its toxicity. The symptoms and treatment of poisoning are the same as for phenol. Dose: 0.12 gm. (2 grains).

Trinitrophenol—Trinitrophenol, $\text{C}_6\text{H}_2\text{OH}(\text{NO}_2)_3$ 2:4:6, (Picric acid).

Caution.—Picric acid explodes when heated rapidly or when subjected to percussion. For safety in transportation, it should be mixed with 10 to 20 percent water.

Action.—Trinitrophenol has germicidal, astringent, and local anesthetic properties. It has a phenol coefficient of

6. It is used as a surgical disinfectant in about one-half to 1 percent solutions. It is also used in the form of a solution or "picric acid gauze" in the treatment of eczema, fever blisters, and other skin diseases. As an astringent, it is used in dusting powders for excessive sweating of the feet. Local application of high concentrations of this drug frequently cause a dermatitis known as "picric acid itch," characterized by severe pruritis, vesicle formation, edema, and acute weeping eczema.

Toxicology.—It taken orally, it produces symptoms consisting of severe gastroenteritis, nausea, vomiting, with vomitus stained yellow, intense headache, progressive stupor, and anuria. The skin often becomes yellow, accompanied by intense itching and sometimes eruptions resembling eczema. Coma and death may follow. Picric acid hemolyzes the red blood cells and causes acute nephritis and liver damage.

Treatment

1. Gastric lavage with egg albumin or milk.
2. Symptomatic treatment.

Parachlorophenol—(4-Chloro-Phenol).

Action.—Parachlorophenol is used locally for its bactericidal action on gram-negative organisms. It is usually employed in the form of ointment.

Undecylenic Acid—Acidum Undecylenicum (10-Hendecenoic Acid).

Action.—Undecylenic acid is a fatty acid, a component of sweat, used as a fungicide. It is used as an ointment or dusting powder.

Compound Undecylenic Acid Ointment—(Desenex Ointment).—5 percent undecylenic acid, 20 percent zinc undecylenate.

Zinc Undecylenate—Zinci Undecylenas.—It is used as a fungicide in the form of dusting powder or ointment.

Chrysarobin—Chrysarobinum.

Action.—The chief active constituent is largely a complex mixture of reduction products of chrysophanic acid. Chrysarobin is used as a parasiticide in the treatment of parasitic

skin disease, such as psoriasis and ringworm. It is one of the most effective agents used in psoriasis. It is usually employed in ointments. It is absorbed through the skin and appears in the urine, coloring it red. Unless well diluted, it is very irritating to the skin.

Chrysarobin Ointment.—6 percent.

Benzyl Benzoate—Benzylis Benzoas.—The benzyl ester of benzoic acid.

Action.—Applied in the form of the lotion, it is effective as a scabicide and for the eradication of head lice; orally it is used as an antispasmodic in spasms of the smooth muscle, particularly the uterus. It may be administered in doses of 1 to 2 teaspoonfuls of 20 percent alcoholic solution, diluted with milk or water and unsweetened.

Benzyl Benzoate Lotion.—25 percent.

Saponated Benzyl Benzoate.—A concentrate which is diluted with three parts of water to give the finished lotion.

Benzyl Benzoate Chlorophenothane Lotion.

Action.—The insecticidal action of the chlorophenothane increases the efficiency of the lotion as a scabicide and pediculicide. The ethyl aminobenzoate allays itching. The emulsifying agent in the lotion is polysorbate 80 (Tween 80).

Chlorophenothane (DDT).—Only the purified grade of DDT should be used in medicinal preparations.

Iodine—Iodum, I.—Iodine is effective as a germicide against all bacteria. It is unique in showing little selective action; the concentration necessary for disinfection is practically the same for all microorganisms. It is also an effective fungicide.

Action.—Iodine is used chiefly as a skin disinfectant for application to wounds and abrasions. A 2 percent solution is used for application to mucous membranes. It is also employed in the treatment of skin infections because of bacteria and fungi. It is sometimes used to sterilize water; one drop in a quart of water will disinfect it against bacteria and amebae. Iodine is an effective chemical antidote for alkaloidal poisonings.

Toxicology.—Its toxic effects are largely due to corrosive action on the gastrointestinal tract. The symptoms are

epigastric and abdominal pain; diarrhea, possibly with bloody stools; brown stain on the mucous membrane of the mouth; vomiting. If starch is present in the stomach the vomitus may be blue. The large amounts of fluids lost in diarrhea and vomiting may result in shock. Death is caused by shock, acute corrosive gastritis, and asphyxiation due to edema of the glottis.

Treatment

1. Gastric lavage with chemical antidotes, such as starch or solution of sodium thiosulfate.

2. Symptomatic treatment.

Some patients have an idiosyncrasy for iodine and may develop a skin rash even from a local application.

Benzalkonium Chloride.—Benzalkonii Chloridum (Zephiran Chloride, Alkyldimethyl-benzyl-ammonium Chloride).

Action.—This is one of the newer antiseptics of the cationic type, in which the active ion bears a positive charge. It is used in various concentrations as a disinfectant and fungicide. Solutions have a low surface tension and foam when shaken. The benzalkonium ion is incompatible with anionic wetting agents, including soap, which should not be used with it or before its use for disinfecting the skin.

For disinfection of the skin a 1:1,000 solution is used; for wet dressings and irrigations of the eye, ear, nose, and throat, a 1:10,000 to 1:5,000 solution; for sterile storage of instruments, a 1:5,000 to 1:1,000 solution, to each liter of which 2 gm. of sodium nitrite and 5 gm. of sodium carbonate should be added to prevent rust.

Benzalkonium Chloride Solution.

Oxidizing Antiseptics

Action.—These drugs are toxic to microorganisms because they liberate nascent oxygen, which exerts a germicidal action by oxidizing the constituents of the bacterial protoplasm. The microorganisms most susceptible to their action are the Gram-positive bacteria and certain spirochetes and trypanosomes. The antiseptics of this group differ in the ease with which oxygen is liberated, the actions of cation

linked with the oxygen anion, and the substance remaining after oxygen is released.

Medicinal Zinc Peroxide—Zinci Peroxidum Medicinale.—Medicinal Zinc Peroxide releases nascent oxygen slowly. It is used in the form of a suspension as a dressing for badly infected wounds, particularly those infected with anaerobic bacteria. For this purpose, it should be sterilized in small quantities by heating for 4 hours at 140° C., then mixed with sterile distilled water into a creamy suspension. It is also used as a wash by suspending in water for the treatment of certain oral infections.

Gold Sodium Thiosulfate—Auri et Sodii Thiosulfas.—It is used as an antibacterial and antiarthritic.

Caution.—All gold salts are toxic. Toxic reactions are controlled by regular examinations of the skin, mouth, and blood.

Sterile Gold Sodium Thiosulfate.—Dose: To be determined by the physician.

Aromatic Sodium Perborate.

Sodium Perborate Monohydrated.—It contains 16 per cent available oxygen.

Action.—It is a powerful oxidizing agent. It is used as an antiseptic in irrigations of the urethra and vagina and as a fungicide in the treatment of athlete's foot and other fungus skin infections, by soaking. Solutions are employed to oxidize the venom in snake bites. It is used as a wet dressing in treatment of poison ivy, and in solution as a chemical antidote for poisoning by various drugs.

Silver Preparations

Silver compounds have a wide variety of uses as caustics, astringents, antiseptics, and germicides. Their activity resides in the silver ion, which is a protein precipitant. It is toxic to bacteria by precipitating the protein in the bacterial protoplasm. It exerts the same action on body tissues, the ion present in the active silver salts being particularly potent. Silver compounds are of two types, the simple silver salts, which ionize readily in solution and the colloidal silver preparations, in which the silver does not

exist to any large extent as free ions. The two classes differ greatly in their pharmacological action.

Action.—The simple silver salts are highly germicidal. Only one, Silver Nitrate, is official. They are very destructive to tissue and may be classed as caustics and corrosives as well as germicides. They have two stages of action: (1) The immediate germicidal and irritant action due to precipitation of protein by the free silver ion; (2) the milder and sustained antiseptic effect brought about by the formation of a protein silver compound which slowly liberates small amounts of ionic silver. Colloidal silver compounds, which contain very little ionizable silver, exert only the second action. Use of any silver preparation over a long period may cause a discoloration of the skin and mucous membrane known as argyria.

The colloidal silver preparations contain high concentrations of silver, largely in nonionized form. Their antiseptic value depends on the activity of the free silver ions and not on their content. They do not precipitate protein but penetrate the tissue more readily than does silver nitrate. Those mentioned here are silver proteins and silver halides.

Colloidal silver preparations are used as antiseptics, particularly for application to the mucous membranes of the eye, nose, throat, urethra, bladder, and colon. They are commonly used for infections of the upper respiratory tract. They are prepared in the form of solutions, ointments, swabs, suppositories, and tampons.

Silver Nitrate.—Argenti Nitras, AgNO_3 .

Action.—Silver nitrate is used in solutions varying from 0.01 to 10 percent. It is used as a mild antiseptic and astringent in irrigations of the bladder and urethra; as a germicide in treatment of infected ulcers of the mouth and throat; as a prophylaxis against gonorrheal conjunctivitis, applied to the eyes of the newborn in 1 percent solution; in concentrated solution as a styptic.

Toxicology.—The symptoms are gastroenteritis, convulsions, profound changes in respiration, paralysis, and coma. The treatment consists of the prompt administration of a chemical antidote, such as any soluble nontoxic chloride,

sulfate, soap, or weak alkalis, followed by symptomatic treatment.

Copper Salts

Copper salts are germicidal and fungicidal astringents. They are used in the treatment of fungus infections, and since their astringent action makes them irritant to the stomach, they are sometimes employed as emetics in poisoning.

Cupric Sulfate.—Cupri Sulfas, CuSO_4 (Copper Sulfate, Blue Vitriol).

Action.—Cupric Sulfate is commonly used as a fungicide and also as an astringent in treatment of chronic conditions of the mucous membrane. It is given as an emetic in poisoning and as a chemical antidote in phosphorus poisoning. It is used as a hematinic in combination with iron salts, as copper, to aid in the utilization of iron in the body.

Toxicology.—The symptoms are a metallic taste in the mouth, nausea, vomiting, severe pain in the stomach, and violent headache. The tissue with which it came in contact may be stained black. The stools are frequent, black, and bloody; the urine is yellow and there is pain on voiding. There may be convulsions, followed by death.

Treatment

1. Give the chemical antidote, potassium ferrocyanide, which forms an insoluble cupric ferrocyanide.

2. Soap, alkalis, albuminous drinks, or milk will serve as chemical antidotes.

3. They all form insoluble compounds which should be removed by gastric lavage.

4. Symptomatic treatment.

Mercury Compounds

Action.—The inorganic mercury compounds have an antiseptic action. Their activity depends on the release of the “mercuric” ion, which has an affinity for protein and precipitates it. This action is not selective for bacterial protoplasm, so these compounds are very irritating to tissue, have

poor penetrating power, and lose much of their germicidal power in the presence of a large amount of protein. They are very toxic after absorption. The ones which ionize most completely corrode metal and cannot be used for disinfecting instruments. Spores are resistant to mercury compounds.

Toxicology.—Acute poisoning usually results from oral ingestion of some highly ionizable salt like mercury bichloride. Early in the poisoning, the mouth and pharynx become ashen gray. There is severe epigastric pain, a metallic taste in the mouth, and vomiting, which helps to rid the stomach of the poison. If allowed to remain in the stomach, the mercury salt is absorbed, and systemic reactions will occur. If the poison reaches the intestines there is severe irritation, resulting in profuse bloody diarrhea, which may cause shock and death. The patient usually recovers from the local symptoms if vomiting has been sufficient and the chemical antidotes have been administered. Systemic reactions may occur in a few hours and last for several days, finally causing death. The pulse is irregular and faint, respiration shallow, skin cold and clammy, features pinched, saliva metallic in taste and excessive in secretion, breath foul, gums sore, and the gum line colored blue. Later the teeth become loose. Severe diarrhea may cause acidosis, and widespread capillary damage may cause shock. Kidney damage is usually the cause of death.

Treatment

1. Emetic or gastric lavage.
2. Use of the chemical antidote sodium formaldehyde sulf-oxylate is recommended. The stomach is washed with 250 cc. of 5 percent solution, and another 250 cc. is allowed to remain in the stomach.
3. It may also be injected into the circulation, using about 10 gm. in 200 cc. of fluid. The sodium formaldehyde sulf-oxylate forms a less soluble monovalent salt.
4. Other antidotes are albuminous drinks, milk, and egg white.
5. Immediate lavage must follow to prevent absorption of the mercury albuminate formed.

6. Symptomatic treatment to relieve pain, maintain normal composition of body fluids, and treat shock and acidosis.

7. Dimercaprol (BAL) is very useful in treating heavy metal poisoning.

Chronic poisoning is usually the result of exposure to inorganic mercury compounds over an extended period of time. The symptoms are stomatitis, colitis, progressive kidney damage, loss of appetite, nutritional disturbances, anemia, mental depression, and insomnia. The treatment consists of removal of the source of poisoning and symptomatic treatment. The response is slow and the illness may last for several years.

Mercury.—Hydrargyrum, Hg (Quicksilver).

Action.—Metallic mercury in bulk is not absorbable, but in a finely divided state it is taken up from the intestinal tract. It is probably absorbed as an albuminate or oxide and produces its effect as the mercuric ion. Its elimination is rather slow, giving it a cumulative action. It has an inhibitive action on the *Treponema pallidum*. At one time strong mercurial ointment was used in the form of "Mercury Rubs" for the treatment of syphilis. Mass of mercury is also an antiluetic. Mild mercurial ointment is used in the treatment of infestation with lice.

Metallic mercury is prescribed in its official preparation.

Mercury Bichloride.—Hydrargyri Bichloridum, HgCl_2 (Corrosive Sublimate, Mercuric Chloride).

Caution: Extremely poisonous.

It is commonly used as a disinfectant for inanimate objects and unabraded skin. A 1:1,000 solution is used to sterilize certain surgical instruments which cannot be boiled. A 1:500 to 1:1,000 solution is used to rid the body and head of lice. It is marketed in the form of the official Poison Tablets. These must conform to the official requirements: (1) The shape must be angular and not discoid; (2) the color must be anything but white; (3) they must be packaged in containers having an angular shape with roughened edges; and (4) the container must bear the word "Poison" on the label and state the quantity of HgCl_2 in each tablet.

Ammoniated Mercury.—Hydrargyrum Ammoniatum, HgNH_2Cl (White Precipitate).

Action.—It is used in the treatment of parasitic skin diseases such as fungus infections and impetigo in the form of the ointment. Care must be taken not to rub it into the skin too vigorously, as it may produce dermatitis or be absorbed with undesirable effects.

Ammoniated Mercury Ointment (White Precipitate Ointment).—5 percent.

Ammoniated Mercury Ophthalmic Ointment.—3 percent.

Miscellaneous Antiseptics

Boric Acid—Acidum Boricum (Boracic Acid).—Boric acid is obtained from borax by treating it with hot solutions of hydrochloric or sulfuric acid. When Boric Acid is mixed with salicylic acid, the combination acts as an alkaloidal precipitant.

Action.—Boric Acid is a weak antiseptic. Aqueous solutions inhibit bacterial growth. They are nonirritating and therefore suitable for application to delicate structures. In aqueous solution, Boric Acid is used as an antiseptic irrigation for the eyes, nasal passages, mouth and bladder. The ointment, dusting powder, and solutions are employed in the treatment of skin diseases, bed sores, and similar conditions.

Toxicology.—Oral ingestion of Boric Acid may cause nausea, vomiting, abdominal pain, diarrhea, headache, weakness, visual disturbances, renal injury, and possible collapse. The treatment is symptomatic.

Formaldehyde Solution.—Liquor Formaldehydi (Formalin).

Action.—Formaldehyde is an irritant and general protoplasmic poison. In high concentrations it precipitates protein, and even in low concentration it is toxic to cells. In proper concentrations, it is an effective germicide against all forms of organisms. It is used as a disinfectant for inanimate objects. Well diluted, it is employed as irrigations for vaginal infections, fungus infections of the skin, and poison ivy.

Because of its astringent action, it is sometimes used in about 20 percent solution to check excessive sweating.

Toxicology.—Symptoms may be noted after exposure to formaldehyde gas, including intense irritation of the eyes and respiratory tract, resulting in conjunctivities, coryza, bronchitis, and even pneumonia. If taken by mouth, there is irritation of the mouth, throat, and gastrointestinal tract, with severe pain, vomiting, and diarrhea. It depresses the central nervous system and may cause symptoms similar to alcohol intoxication, such as vertigo, depression, and coma. Convulsions occur rarely. Severe acidosis may result from the formation of formic acid. The urine is scant, containing red cells and casts.

Treatment

1. Gastric lavage.
2. Use of demulcents.
3. Symptomatic treatment.

SULFONAMIDES

Action.—There are two factors in the mechanism of action of the sulfonamides: (1) the direct action of the drug, producing a bacteriostasis; (2) the involvement of the defense forces of the host, the leucocytes. The drug inhibits the growth of the bacteria and allows the leucocytes to cope with the infection. Leucocytes are essential to the bactericidal action.

The essential growth substance of many bacteria is para-aminobenzoic acid. Since the sulfonamides are similar in structure to para-aminobenzoic acid, they can displace it from the enzymatic reaction and inhibit the growth of the bacterial cells. There must be enough sulfonamide present to displace all of the para-aminobenzoic acid, so large doses are necessary at the beginning of therapy to build up the proper blood level. Sulfonamides have no beneficial pharmacological action aside from their effect on bacteria. Some patients experience toxic reactions such as cyanosis, nausea and vomiting, headache, dizziness, drug rash, and acidosis.

Acute hemolytic anemia is not uncommon; leukopenia may occur at any time; granulocytopenia may occur between the fifteenth and fortieth day of therapy.

In treating these reactions, it is advisable to discontinue the drug, administer fluids, give sodium bicarbonate to overcome acidosis, give blood transfusions if necessary, and treat symptomatically.

Certain routine procedures should be observed during therapy with sulfonamides. A proper blood level should be maintained, and complete blood count and urinalysis should be done before and during the course of treatment.

Sulfonamides are also administered locally. Pus and necrotic tissue should be removed before the sulfonamides are applied, as they oppose the action of sulfonamides. The drug may be sprinkled on the wound as a powder or applied as an ointment to infected areas. Local application is not always effective.

Sulfonamides are administered orally, intravenously, rectally, by retention enema, and topically. For detailed individual descriptions of the sulfonamides, refer to New and Nonofficial Remedies.

Sulfanilamide.—Sulfanilamidum.

Action.—Sulfanilamide has a potent antibacterial effect on group A hemolytic Streptococci, meningococci, gonococci, E. Coli and Proteus vulgaris of the urinary tract, and certain other organisms. It is used in the treatment of scarlet fever, erysipelas, mastoiditis, meningococcic meningitis, chancroid and lymphopathia venereum, trachoma, follicular conjunctivitis, and in mixed infections of the kidney and pelvis.

In the treatment of gonorrhea it has been largely replaced by sulfathiazole and sulfadiazine. It should be administered with sodium bicarbonate to overcome possible acidosis. Dose: 2 gm. (30 grain).

The sulfonamides are ineffective against syphilis, tuberculosis, malaria, typhoid fever, and common colds.

Sulfapyridine.—Sulfapyridinum.

Action.—It is used in the treatment of bacterial pneumonias, meningitis, gonorrhea and other infections of the urinary tract, streptococcal infections, trachoma, and lymphogran-

uloma. The daily urine output should be maintained at not less than 1,000 cc. to avoid hematuria and obstruction by formation of acetylsulfapyridine crystals. There is no disturbance in the acid-base equilibrium, so it is unnecessary to give sodium bicarbonate in conjunction with this drug. Dose: 2 gm. (30 grains).

Sulfathiazole.—Sulfathiazolum.

Action.—Sulfathiazole is less toxic than sulfapyridine. Unlike the other sulfonamides, it is rapidly excreted, and a suitable blood level is difficult to maintain. It diffuses less rapidly into the spinal fluid than other sulfonamides.

It is used in the treatment of bacterial pneumonias, meningitis, staphylococcal bacteremia, boils and carbuncles, cellulitis, osteomyelitis, severe streptococcal infections, gonorrhea, and acute bacillary dysentery. The daily urine output should be maintained at not less than 1,000 cc. to avoid hematuria and kidney obstruction caused by formation of crystals. Dose: 2 gm. (30 grains).

Sulfadiazine.—Sulfadiazinum.

Action.—It is of relatively low toxicity and is well tolerated in the body. Effective blood levels with this drug are rapidly reached and sustained on therapeutic oral doses. A daily urine output above 1,000 cc. should be maintained to avoid urinary obstruction. Forced fluids and sodium bicarbonate are recommended with this drug.

Sulfadiazine is effective in treatment of pneumococcic pneumonia and meningococcic and pneumococcic meningitis, in the prophylaxis and treatment of gonorrheal and other genitourinary tract infections, in severe hemolytic streptococcic and staphylococcic infections, and in other sulfonamide-susceptible infections. Dose: 2 gm. (30 grains).

Sulfamerazine.—Sulfamerazinum.

Action.—Sulfamerazine is closely related chemically to sulfadiazine but it is much more rapidly absorbed from the intestinal tract and more slowly excreted, so it need not be given as frequently or in as large doses to maintain proper blood levels. In a free state it is more soluble than sulfadiazine at any pH, and in the acetylated form it is less likely to have a toxic reaction in the kidney. It passes readily into

the cerebrospinal, pleural, and abdominal fluids. An alkaline urine output above 1,000 cc. per day should be maintained.

Sulfamerazine is used for the same purposes as sulfadiazine. Dose: 2 gm. (30 grains).

Sulfaguanidine.—Sulfaguanidinum.

Action.—It reaches bacteriostatic and bactericidal concentrations in the intestinal tract and exerts its antibacterial action there. It causes very little toxic reaction. It differs from most sulfonamides in being poorly absorbed from the gastrointestinal tract.

Sulfaguanidine is used in the prophylaxis and treatment of bacillary dysentery. It should not be given for more than 2 weeks, and if the response is unsatisfactory it should be discontinued after 1 week. Dose: 2 gm. (30 grains).

Succinylsulfathiazole.—Succinylsulfathiazolum (Sulfasuxidine).

Action.—It has low toxicity and is poorly absorbed from the intestinal tract, where it exerts a bacteriostatic effect against certain bacteria, particularly the Gram-negative organisms such as *E. coli* and dysentery bacilli of the Shiga, Flexner, and Sonne strains. In therapeutic doses it has an inhibiting effect on intestinal flora, resulting in semifluid, practically odorless stools of low bacterial count. It is recommended for preoperative preparation and postoperative treatment of patients requiring surgical operations of the rectum, carcinoma of the colon, fecal fistula, and other operations of the intestinal tract. It is also used in the treatment of acute bacillary dysentery, carriers of dysentery bacilli, and prophylaxis of dysentery. It can be administered for as long a period as necessary. Dose: 2 gm. (30 grains).

Phthalylsulfathiazole.—(Sulfathalidine).

Action.—It is used in the treatment of intestinal infections caused by sulfonamide-susceptible organisms. It is useful in the treatment of inflammation of the intestinal tract and for the presurgical treatment of patients who are to be subjected to surgery of the small intestine or colon. Dose: 2 gm. (30 grains).

The choice of the sulfonamide compound to be used for

the control of known infections should be based on: (1) Bacteriologic diagnosis; (2) knowledge of the experimental therapeutic background of the drugs; (3) their pharmacological properties in man; (4) their clinical efficiency; and (5) the variety, frequency, and severity of the toxic actions which may be produced. When these factors are considered, selection may be made from the drugs in table 12.

TABLE 12.—Sulfonamide Drugs of Choice

	First	Second
Hemolytic streptococcus infection due to Lancefield group A organisms.	Sulfadiazine.	Sulfanilamide.
Pneumococcic infections.....	Sulfamerazine.	
	Sulfapyrazine.	
	Sulfadiazine.	Sulfathiazole.
	Sulfamerazine.	
Gonococcic infections.....	Sulfathiazole.	
	Sulfadiazine.	
Staphylococcic infections.....	Sulfadiazine.	
	Sulfamerazine.	
	Sulfathiazole.	
Meningococcic infections.....	Sulfadiazine.	Sulfathiazole.
	Sulfamerazine.	Sulfanilamide.
	Sulfapyrazine.	Sulfapyridine.
	Sulfadiazine.	Sulfapyridine.
Friedlander's bacillus infection.		
Shigella dispar and hemophilus influenzae infection.	Sulfadiazine.	
Chancroid.....	Sulfanilamide and others.	
Acute bacillary dysentery....	Sulfadiazine.	
	Sulfathiazole.	
	Succinylsulfathiazole.	
	Sulfaguanidine.	

ANTIBIOTICS

Antibiotics are products of living microorganisms which kill or inhibit the growth of other microorganisms. In 1929 Fleming discovered the bacteriolytic effect of the

mould *Penicillium notatum* on a culture of *Staphylococcus aureus*. In 1936 at Oxford University Florey and his assistants isolated the active principle and named it penicillin. In the meantime bacteriologists and chemists were seeking similar substances. In 1939 Dubos isolated an extract from *Bacillus brevis*, a strain of soil bacteria, which he named tyrothricin. Streptomycin was discovered by Waksman in 1943. Several other antibiotics have been developed, but only a few are effective and nontoxic in the human body. In some, the toxicity has been greatly reduced by purification of the principle. They have been developed from moulds (as penicillin), actinomyces (as streptomycin), and bacteria (as tyrothricin).

Penicillin

Penicillin is the antibacterial substance derived from the mould, *Penicillium notatum* or *Penicillium chrysogenum*. Several isomeric forms have been identified and designated as penicillin F, G, K, and X. Commercial preparations contain principally penicillin G, but a few have appreciable amounts of penicillin X. These forms differ in their therapeutic effectiveness against different organisms. Penicillin X is more effective against gonorrheal infections, but penicillin G is more effective against syphilis. Penicillin F and K are for the most part inactivated in the body, so the blood levels attained following their administration is low, and their therapeutic actions are feeble. These forms are very hard to crystallize.

Action.—Penicillin has a selective action against certain bacteria. It is chiefly effective against certain strains of aerobic and anerobic Gram-positive organisms. Most Gram-negative organisms such as *E. coli*, *Bacillus typhosus*, and the *Salmonella*, and certain strains of Gram-positive organisms are highly resistant. It is effective against certain spirochetes, moulds, and viruses.

Penicillin is practically nontoxic. Some patients have urticarial reactions, even after local application.

Penicillin solutions are most stable at a pH between 5 and 7. They are inactivated by high temperatures. Crystalline

penicillin G is stable at ordinary temperatures, but its solution should be kept refrigerated.

Standardization.—The potency of penicillin is expressed in terms of the international unit, which is similar to the Oxford unit. It is the amount of penicillin activity which forms a zone of inhibition 24 mm. in diameter around a cylinder in an agar plate inoculated with *Staphylococcus aureus* and is equivalent to 0.6 microgram of crystalline sodium penicillin G.

Penicillin is effective in the treatment of:

1. All staphylococcic infections with or without bacteremia, such as acute and chronic osteomyelitis, carbuncles, meningitis, pneumonia and wound infections.

2. All hemolytic streptococcic infections with bacteremia and all serous local infections, such as cellulitis, pneumonia empyema, puerperal sepsis, peritonitis, and endocarditis.

3. All clostridial infections, such as gas gangrene.

4. All anaerobic streptococcic infections.

5. All pneumococcic infections of meninges, pleura, and endocardium.

6. All gonococcic infections.

7. All anthrax.

8. Vincent's angina infection.

9. Syphilis.

It is effective in the treatment of diphtheria, in conjunction with the antitoxin, and of actinomycosis. It is ineffective against typhoid, *E. coli* infections of the urinary tract, tularemia, tuberculosis, undulant fever, and other diseases caused by Gram-negative organisms.

Penicillin may be administered parenterally, orally in tablets or lozenges, or topically in ointments, creams, irrigations, or wet dressings. When it is given orally, a buffer such as sodium citrate, calcium carbonate, aluminum hydroxide gel, kaolin, magnesium oxide, or citric acid should be added to minimize gastric acidity.

Bacteria may become resistant to penicillin if subjected to sublethal concentrations of the drug, so it is essential that effective doses be administered at the beginning of the course of treatment.

Penicillin Potassium.—The potassium salt of an antibiotic substance produced by the growth of *Penicillium notatum* or *Penicillium chrysogenum*, or by other means. Dose: oral on a fasting stomach 1,500,000 units; intramuscular, 300,000 units daily.

Penicillin G Potassium—(Benzyl Penicillin Potassium, Crystalline Penicillin Potassium G).—Dose: oral on a fasting stomach 1,500,000 units, or intramuscular, 300,000 units daily.

Penicillin G Procaine.—The procaine salt of Penicillin G.

Penicillin Sodium—*Penicillium Sodicum*.—The sodium salt of an antibiotic substance or substances produced by the growth of *Penicillium notatum* or *Penicillium chrysogenum* (Fam. *Aspergillaceae*) or by other means.

Description and dose are the same as for penicillin potassium.

Penicillin G Sodium—(Benzyl Penicillin Sodium, Crystalline Penicillin Sodium G).—Dose: oral on a fasting stomach, 1,500,000 units or intramuscular, 300,000 units.

Buffered Crystalline Penicillin.

Penicillin for Inhalation.

Penicillin Procaine for Aqueous Injection.—Dose: daily, intramuscular, 300,000 units.

Penicillin Procaine in Oil Injection.—Dose: intramuscular, 300,000 units.

Penicillin Ointment.

Penicillin Tablets.—Dose: on a fasting stomach, 1,500,000 units.

Penicillin Troches.—Dose: 1 troche.

Streptomycin

Streptomycin is the purified active principle obtained from the cultures of certain strains of the actinomycete, *Streptomyces griseus*. It is marketed as the hydrochloride and sulfate, both of which are freely soluble in water or normal saline solution.

Action.—Streptomycin is of low toxicity and is effective against both Gram-positive and Gram-negative bacteria.

It is a drug of choice in Gram-negative infections of the urinary tract, Hemophilus influenza infections such as endocarditis, pulmonary infections, and meningitis, other types of meningitis due to Gram-negative bacteria, bacteremia, tularemia, middle ear infections, Shigella dysenteries, peritonitis, and Klebsiella (Friedlander) Pneumonia. It has a suppressive effect on tuberculosis and is used in the treatment of all forms.

Streptomycin is administered parenterally. The initial dosage must be large enough to inhibit or kill the microorganisms, or they may become streptomycin resistant.

The potency of Streptomycin is expressed in terms of the metric weight of pure streptomycin base. A streptomycin unit is equivalent to 1 microgram (0.001 mg.) of streptomycin base.

Dihydrostreptomycin.—It is produced by the hydrogenation of streptomycin. It is usually supplied in the form of hydrochloride or sulfate.

Action.—Its uses are the same as those of streptomycin, but somewhat larger doses are given.

Tyrothricin

Tyrothricin is an antibiotic extracted from the sporulating soil bacterium, Bacillus brevis. It contains two water soluble principles, tyrocidine and gramicidin. Tyrocidine is toxic to tissue cells and in buffered solutions is bactericidal against many organisms. Gramicidin is nontoxic and is more active than tyrocidine. It has a selective action against Gram-positive cocci and bacilli.

Action.—Tyrothricin is ineffective and toxic when administered orally or parenterally. Applied topically, it is effective in superficial infections with pneumococci, staphylococci, streptococci, and similar Gram-positive pathogens. It is used in the treatment of impetigo, postular dermatitis, chronic abscesses, secondarily infected dermatitis, and similar surface infections when caused by predominating Gram-positive organisms, infected wounds, osteomyelitis, and certain infections of the eye and nasal sinuses. It is administered topically in 1:2,000 solution. Higher con-

centrations are irritating to tissue. It is marketed as a 2 percent alcoholic solution to be diluted before use.

Tyrothricin Troches.—(Tyrozets, Lozilles, Teeds, Pemzoles).

Aureomycin Hydrochloride

The hydrochloride of several antibiotic substances produced by the growth of *Streptomyces Aureofaciens* or by other means.

Action.—It acts as a specific in the rickettsial diseases. It is useful in primary atypical pneumonia, lymphogranuloma venerum, granuloma inguinale, brucellosis, tularemia, pertussis, and herpes zoster. It is usually given orally, and some gastric distress may follow its use.

Aureomycin Hydrochloride Capsules.

Chloramphenicol (Chloromycetin)

An antibiotic produced by the growth of *Streptomyces venezuelas* and synthetically. A white or grayish white or yellowish crystalline powder.

Action.—It is effective in the rickettsial diseases. It is useful in brucellosis, pertussis, urinary infection caused by *Ps. aeruginosa*, *E. coli*, and *Proteus vulgaris*.

It is the drug of first choice in typhoid fever and may be used in the treatment of gonorrhea when caused by penicillin resistant organisms.

Chloramphenicol Capsule.

ANTHELMINTICS

Anthelmintics are drugs which expel, paralyze, or kill intestinal worms. They are divided into vermicides, which kill or paralyze the worm, and vermifuges, which cause its expulsion. Taeniacides and taeniafuges act on the tapeworm.

The worms which commonly infest man are pinworm, seatworm, whipworm, fluke, threadworm, roundworm, hookworm, and tapeworm. They infest the intestinal tract and some, particularly the flukes, penetrate the tissue of certain

organs. They injure the host by robbing him of food, causing mechanical injury to the organs or obstructing ducts, producing toxic substances which may be absorbed by the host, and providing an entry for bacteria and other organisms by injuries to the body tissue.

Toxicology.—Most anthelmintics are toxic to the host as well as to the worm. Many of the older drugs are highly toxic, and they are being replaced by synthetic drugs which are safe as well as effective.

Two or three days prior to administration of the drug, the patient should be placed on a fat-free diet, high in protein and carbohydrate. It is usually given on an empty stomach and followed within a few hours with a saline cathartic.

Aspidium—Aspidium (Male Fern, Marginal Fern).—Aspidium contains about 1.5 percent filicin as the active constituent. It is particularly effective against tapeworm.

Toxicology.—Aspidium is an irritant to the intestinal tract. It stimulates the spinal cord, sometimes producing convulsions. The stimulation is followed by depression, affecting also the medulla, respiration, heart, and smooth muscle. In mild poisoning there may be headache and vertigo, followed by gastroenteritis, nausea and vomiting, visual disturbances, convulsions, and delirium.

Treatment

Immediate purging of the intestinal tract, symptomatic treatment.

Aspidium Oleoresin.—Single dose: 4.0 gm. (60 grains).

Santonin.—Santoninum.

Action.—Santonin is a vermifuge, mainly effective against roundworms. It irritates the worms so that they migrate from the small intestine to the large intestine, from which they are eliminated alive and active.

Santonin is one of the simplest anthelmintics to administer, as it is tasteless and nonirritating. In small doses, its only noticeable effect is on the sight, causing yellow vision. In large doses it stimulates and then depresses the central nervous system and depresses the heart. Dose: 60 mg. (1 grain).

Toxicology.—The symptoms are yellow vision, headache, vomiting, nausea, abdominal pain, diarrhea, depression of the heart, and respiration, and possible convulsions. The skin may be cold and clammy, and a rash may develop. Treatment consists of gastric lavage, a saline cathartic, and symptomatic treatment.

Hexylresorcinol.—Hexylresorcinol (Caprokol, Crystoids Anthelmintics).

Action.—Hexylresorcinol is a powerful vermicide of low toxicity, effective against hookworm, pinworm, dwarf tapeworm, whipworm, and ascaris. It is particularly useful in the treatment of debilitated persons or children. It is used locally as a germicide and disinfectant in a 1:1,000 solution commonly known as "S.T.37" solution. It is occasionally used as a urinary antiseptic but has been largely replaced by the sulfonamides and methenamine.

It is administered orally in the form of pills with a hard gelatin coating. They should not be bitten into because contact of the drug with the mucous membrane may cause painful ulcerations. Dose: Anthelmintic, 1 gm. (15 grains).

ARSENICALS

Arsenicals are divided into two classes, inorganic and organic. The inorganic arsenicals are powerful poisons, highly toxic to all cells, and are generally employed for their effect on body tissue. The organic arsenicals are less toxic to mammals but very poisonous to certain protozoa. The main purpose in their use is to produce a maximal effect on the invading organism with a minimal effect on the body tissue.

They are used in the treatment of protozoal infections.

Arsenicals may be either trivalent or pentavalent. Only the trivalent compounds are active either toxicologically or therapeutically, but in the body the pentavalent arsenicals are reduced to the trivalent state.

Action.—Arsenic is a general protoplasmic poison. Locally it has a weak effect on the skin. At first it produces a mild irritation but prolonged application may cause cell injury and necrosis. It has a pronounced effect on circulation.

Large doses cause extreme vasodilation, resulting in an escape of plasma from the circulation and a lowering of blood pressure, sometimes to shock level.

The vasodilation in the gastrointestinal tract caused by small doses may result in increased secretion and absorption. Large doses may cause blisters to form in the intestines as a result of the escaping plasma. The blisters break, the epithelial fragments are cast off, and the plasma escapes. The presence of the plasma and the irritant action of the arsenic cause a diarrhea with "rice water" stools. Arsenic also damages the kidney capillaries, tubules, and glomeruli.

By its vasodilating effect, arsenic may aid the nutrition of the skin and give it a healthy appearance, but continued use may lead to abnormal proliferation of the skin, finally resulting in atrophy and degeneration, and may also cause peripheral neuritis. Arsenic affects the function of the bone marrow and alters the cellular composition of the blood. In a normal individual, small doses may lower the red cell count and large amounts may cause changes in the appearance of the cells. In anemia it may cause increase of the immature red cells and a decrease in the mature cells. Arsenic aids in the utilization of iron in the body and may act as an adjuvant to iron in the formation of red cells. It inhibits the formation of white cells when they are in excess and is used for this action in the treatment of leukemia.

Toxicology.—In acute poisoning the symptoms generally begin in from 15 to 30 minutes with an intense burning pain in the epigastrium, soon spreading to the whole abdomen. This is often accompanied by a constriction of the throat and an acrid, metallic taste, soon followed by violent vomiting and purging. The vomitus may be bilious or bloody. There is a profuse diarrhea with characteristic "rice water" stools. As the poisoning progresses, thirst becomes excessive, urine is suppressed, the extremities are cold, the pulse rapid and weak, respiration rapid and labored and painful from abdominal tenderness, the skin is dark and cyanosed, and the patient suffers from violent cramps. Collapse, convulsions, and coma ensue, death occurring in from 5 to 30 hours.

Prompt evacuation of the stomach.

Even if the patient has vomited, gastric lavage is advisable.

Freshly precipitated ferric hydroxide may be used as a chemical antidote to form an insoluble arsenic compound in the stomach.

The patient should then be treated symptomatically, with particular attention to fluid loss and shock.

Chronic poisoning, which may result from repeated administration of small doses or exposure to arsenic compounds over a long period, is difficult to diagnose. The first symptoms may be associated with many disorders. They include weakness, loss of appetite, occasional nausea and vomiting, diarrhea or constipation, a garlicky odor on the breath, congestion of the conjunctivae and symptoms of acute coryza, salivation, stomatitis, dermatitis, loss of hair and nails, liver and kidney disorders, peripheral neuritis affecting the extremities and blood disorders.

Treatment.—Removal of the source of poisoning and symptomatic treatment.

BAL (British Anti-Lewisite) is used in poisoning by such drugs as mapharsen. It is indicated in arsenic reactions, such as toxic encephalopathy, blood dyscrasies, dermatitis, and sudden febrile reactions occurring about 12 hours after administration of the arsenical. BAL has a greater affinity for the heavy metals than do the —SH groups in the cells and apparently removes the metal from the cell, forming a “metal-BAL compound.” Probably a thioarsenite is formed which is rapidly eliminated from the body. BAL has the same action in mercurial poisoning. It is administered in oil.

Potassium Arsenite Solution—(Fowler's Solution).—Dose: 0.2 cc. (3 min.).

ANTIMONY COMPOUNDS

Antimony is used as a parasiticide in the treatment of protozoan infections, such as leishmaniasis, schistosomiasis, filariasis, and trypanosomiasis. It closely resembles arsenic as a chemotherapeutic agent. Locally it is more irritant than

arsenic, producing pustules and vesicles on the skin. Its salts are emetics or, in smaller doses, nauseating expectorants.

Toxicology.—The symptoms are similar to those of arsenic. The outstanding effect of acute poisoning is shock, produced by pronounced vasodilation. Vomiting is considerable.

The treatment consists of gastric lavage with tannic acid, even if vomiting has occurred, followed by demulcents, opiates to relieve pain and diarrhea, and symptomatic treatment.

Suramin Sodium—Sumarinum Sodicum (Naphuride, Bayer 205).—A potent trypanosomicide, being effective in both the first and second stages of the infection. It is slowly eliminated and remains active in the body for a considerable period, protecting it against reinfection with the trypanosomes of African sleeping sickness. It is also of value in the prophylaxis of this disease. Dose: Intravenous, 1 gm. (15 grains).

The cumulative effect of the drug or large doses may cause undesirable reactions, such as chill, fever, headache, nausea, pruritis, and occasionally conjunctivitis and stomatitis.

ANTIMALARIALS

Quinine.—Quinina.

Action.—Locally quinine is a general protoplasmic poison. Like many other poisons, it stimulates in low concentrations and depresses in high concentrations. It has a paralyzing action on the sensory nerves, with a local anesthetic effect. It lowers body temperature and resembles the salicylates in analgesic potency. Therapeutic doses have little effect on the central nervous and cardiovascular systems, but large doses depress the heart and cause vasodilation. It has an oxytocic action on the uterus. It causes a decrease in leukocytes, particularly the polymorphonuclears. It is irritant to the gastrointestinal tract and increases the secretion of gastric juices. Large doses may cause nausea, vomiting, and diarrhea. It is toxic to bacteria and many unicellular organisms, such as trypanosomes, yeast, plasmodia, and spermatozoa.

Quinine and its salts are used mainly in the treatment of malaria. It is the drug of choice in acute malaria. In the prophylaxis of the disease, it does not prevent infection but keeps the plasmodia at a low level of multiplication, so that the clinical symptoms do not develop.

When the drug is stopped, the disease may appear. It overcomes the acute symptoms of malaria by depressing the multiplication of plasmodia and stimulating some of the parasites to change to a sexual form which cannot cause the disease in man. It is also used in the treatment of black-water fever.

Quinine is used as an analgesic in the treatment of headache, muscular rheumatism, and neuralgia, as an antipyretic, and oxytocic, and a stomachic. Dose: 1 gm. (15 grains).

Toxicology.—The symptoms are ringing in the ears, a sensation of fullness in the head; larger doses may cause difficulty in hearing or deafness. There may be severe headache, flushed skin, disturbed vision, profuse sweating, abdominal pain, nausea, vomiting, purging, difficult breathing, general weakness, delirium, convulsions, and collapse. The treatment is symptomatic. The effects gradually wear off, although partial deafness may persist for several days.

Quinacrine Hydrochloride—Quinacrinae Hydrochloridum (Mepacrine Hydrochloride, Atabrin).—Quinacrine is a very valuable drug in the treatment of various malarial fevers. It does not overcome the clinical symptoms as quickly as quinine, but it causes a more rapid disappearance of the trophozoites from the blood. Like quinine, it reduces the clinical incidence of malaria but it is not a positive preventative.

In proper doses, it is well tolerated and more pleasant to take than quinine. It does not cause cinchonism and has no oxytocic effects. It has also been used in the treatment of blackwater fever. Dose: 0.1 gm. (1½ grains).

Continued use of quinacrine hydrochloride causes a yellow discoloration of the skin, sweat, tears, and urine, which usually disappears a few days after the treatment is stopped. Headache and gastrointestinal symptoms may occur but soon disappear.

Pamaquine Naphthoate.—Pamaquinae Naphthoas (Amin-quin Naphthoate, Plasmochin).

Action.—This drug is more effective than quinine in destroying the sexual forms of the malarial parasite so that the blood is no longer infectious to the mosquito. In cases where full doses of quinine over a period of 3 weeks have not caused the disappearance of the sexual forms, plasmochin effects their elimination in a few days. It is not an effective prophylactic against malaria. It is not recommended as a substitute for quinine except for patients who are sensitive to quinine, but the two are frequently used in conjunction. In this way the dose and toxicity of both can be reduced and both the gametocytes and schizonts are attacked. The relapse rate is considerably reduced.

The excretion of Pamaquine Naphthoate is slow, resulting in cumulative toxicity and causing gastric pain, nausea, headache, dizziness, cyanosis, and methemoglobinemia. Dose: 20 mg. ($\frac{1}{2}$ grain).

Chloroguanide Hydrochloride.—(Guanatol Hydrochloride, Proguanil, Palusil, Drinupol).

Action.—It is used for prophylaxis and treatment of malaria. It is not as fast to act on acute attacks of malaria as some other drugs, but it has a very low toxicity. Dose: 300 mg. (5 grains).

Chloroguanide Hydrochloride Tablets.—Dose: 300 mg. (5 grains).

Chloroquine Phosphate.

Action.—Chloroquine Phosphate is a very effective anti-malarial. It accomplishes a radical cure for falciparum malaria and is an excellent suppressive for vivax. It is less toxic than quinacrine and it does not stain the skin.

Chloroquine Phosphate Tablets.

Pentaquine Phosphate.

Action.—It is not used as a suppressive but as a radical cure of vivax malaria. It is chemically related to pamaquine, but is less toxic and more effective. It should not be given in conjunction with quinacrine, which raises its blood concentration and increases its toxicity. Dose: 0.1 gm. ($1\frac{1}{2}$ grains).

Pentaquine Phosphate Tablets.—Dose: 0.1 gm. ($1\frac{1}{2}$ grains).

AMEBACIDES

Emetine Hydrochloride.—Emetinae Hydrochloridum.

Action.—Emetine has a direct lethal action on the endamoeba histolytica. It is more effective against the motile forms than the cysts, as the concentrations strong enough to destroy the cysts cannot be tolerated by the body. Emetine is only employed to control the diarrheal or dysenteric symptoms. When these disappear, it is replaced by carbarsone, vioform, or chiniofon. It is effective in the treatment of amebic abscesses and in amebic hepatitis.

Emetine should never be administered in doses larger than 60 mg. per day or for a period longer than 10 to 12 days. During the course of therapy the patient should be closely observed for any toxic symptoms. Emetine is a general protoplasmic poison and may cause damage to the liver, kidney, and heart. The first symptoms are nausea, vertigo, and severe diarrhea with bloody stools. Dose: Intramuscular, daily 60 mg. (1 grain).

Carbarsone.—Carbarsonum.

Action.—Carbarsone is an organic pentavalent arsenical. Its direct amebacidal action is due to its arsenic content. It is effective against the cyst and motile forms. It acts only on infection in the intestines and is ineffective against amebae in abscesses of the liver and other organs.

It is used in both acute and chronic cases. It is also employed in the treatment of *Trichomonas vaginalis*. It can be given orally or rectally and requires no special adjuvants, bed rest, or diets. It has very little toxic effect. Dose: Oral, 0.25 gm. (4 grains); rectal, 0.13 gm. (2 grains).

Diiodohydroxyquinoline.—(Diodoquin).

Action.—It is usually administered in the form of tablets, or in the treatment of intestinal amebiasis and also as a trichomonicide. Dose: 1.5 gm. (22 grains).

Diiodohydroxyquinoline Tablets.—Dose: 1.5 gm. (22 grains).

Iodochlorhydroxyquin.—(Vioform).

Action.—It is used internally for intestinal amebiasis and externally as a dusting powder for wounds and skin eruptions. Dose: Daily, 0.75 gm. (12 grains).

Iodochlorhydroxyquin Tablets.—Dose: 0.25 gm. (4 grains).

Compound Iodochlorhydroxyquin Powder.—The compound powder is used in the form of suppositories in the treatment of *Trichomonas vaginalis* vaginitis.

BIOLOGICALS

Biologicals are drug products, the manufacture of which depends upon the use of bacteria and bacterial products. They include serums, viruses, antitoxins, bacterial vaccines, antigens, extracts, and toxoids. They are used for prophylaxis, treatment, and diagnosis of infectious diseases. Their manufacture is controlled by the federal government. The manufacturer must be licensed by the Secretary of the Treasury and carefully examined by the U. S. Public Health Service.

The label on each package must state the name, address, and license number of the manufacturer, the proper name of the product, lot number, expiration date or date of manufacture or issue with period of potency, and the minimum potency or the fact that there is no standard of potency.

When biologicals are used as a prophylaxis, a condition of immunity is produced in the body. Immunity is a condition of the body which exempts it from contracting a contagious disease or which enables it to resist infection effectively. The resistance which exists normally in an animal or human being is termed natural immunity. The resistance to a disease which exists (1) after an attack of the disease or exposure to repeated small doses of infective material (for example, the immunity following a smallpox attack or the immunity that comes in later years of youth and adult life to diphtheria), or (2) after vaccination against it with a specific vaccine or virus (for example, the immunity following vaccination against smallpox and diphtheria) is termed acquired immunity.

There are two types of acquired immunity, active and passive. Active immunity is the immunity acquired by the individual himself, because he has had the disease or because the immunity to it has been artificially produced. Passive immunity is the immunity that depends upon defensive factors not originating in the person or animal protected but passively acquired by the injection of serum from another that has acquired an active immunity to the disease in question.

Some of the defense factors of immunity are—

1. *Antitoxins*, antibodies which neutralize the soluble toxins.

2. *Hemolysins or bacteriolysins*, antibodies which cause complete dissolution of the invading microorganisms.

3. *Opsonins or bacteriotropins*, antibodies which alter the invading microorganisms so that they are more easily destroyed by certain of the body cells (phagocytosis).

4. *Agglutinins and precipitins*, antibodies which agglutinate or precipitate the invading microorganisms.

An *antigen* is any substance that can cause the formation and appearance of specific antibodies in the circulation of animals. Chemical protein structure is the necessary criterion for an antigen, the important structural unit being the aromatic amino acid. The term "antigen" is also commonly used to designate certain materials that lack the power of stimulating the production of antibodies but which possess the property of entering into an immunologic reaction with some constituent of serum (for example, Wassermann antigen). Various kinds of antibodies may be produced by the same antigen.

The word "vaccine" or "cow disease" is from the Latin "vacca" (a cow). Cowpox was called "vaccinia" or "cow disease." The protection against smallpox vaccinia was designated "vaccination." A bacterial vaccine is a suspension of killed pathogenic bacteria in physiological salt solution to which a preservative has been added. It is the same protein that causes the disease, so modified that it will not produce the disease, yet so little altered that it will stimulate the body cells to form the substance which will

promptly destroy the infecting agent. The bacteria are killed in the preparation of vaccines by using heat or chemicals.

When bacteria have successfully invaded the body they produce disease through the following agencies:

1. Soluble or extracellular toxins, which are poisons generated by the bacterial cells and discharged into the surrounding media; for example, diphtheria and tetanus toxins (exotoxins).

2. Intracellular toxins (endotoxins), which are contained in the cell bodies and given off only after death of the bacteria; for example, typhoid endotoxin.

3. Toxin-like substances.

4. Bacterial proteins.

5. Mechanical action of bacteria.

Diphtheria toxin may be converted into toxoid which is nontoxic but has the same combining power with antitoxin as does the toxin from which it is derived. The conversion has been accomplished by heat or by treatment with different percentages of formaldehyde. Diphtheria toxoid treated or precipitated with alum has been found to be an effective immunizing agent.

Serums and antitoxins will produce a passive immunity. Antitoxins are obtained by immunizing a horse with repeated infections of the toxin. After several months the blood acquires a sufficiently high antitoxin content. The horse is then bled, the serum collected, processed, and standardized. Serums are obtained in a similar manner with other animals. Serums are administered both as prophylactic and curative agents.

Phenol, cresol, glycerin, and merthiolate are used as preservatives in biologicals.

Reference should be made to the U. S. P. and N. F. for details concerning official serums, antitoxins, vaccines, toxins, and toxoids.

Antitoxins

Diphtheria Antitoxin.—Dose: Parenteral, therapeutic, 20,000 units; prophylactic, 1,000 units.

Trivalent Gas Gangrene Antitoxin.—Dose: Parenteral, therapeutic or prophylactic, one or more packages as the initial dose.

Scarlet Fever Streptococcus Antitoxin—(Scarlet Fever Antitoxin).—Dose: Diagnostic, not more than 0.2 cc.; therapeutic, 6,000 units; prophylactic, 2,000 units.

Tetanus Antitoxin.—Dose: Parenteral, therapeutic, 20,000 units; prophylactic, 1,500 units.

Tetanus and Gas Gangrene Antitoxin.—Dose: Parenteral, prophylactic, one or more packages.

Toxins

Diagnostic Diphtheria Toxin—(Schick Test Toxin, Diphtheria Toxin for Schick Test).—Dose: Intracutaneous, diagnostic, 0.1 cc. of the dilution.

Scarlet Fever Streptococcus Toxin—(Dick Test Toxin).—Dose: Intracutaneous, diagnostic, 0.1 cc. of the dilution.

Toxoids

Diphtheria Toxoid—(Diphtheria Anatoxoid, Anatoxin-Ramon).—Dose: Hypodermic, 0.5 or 1.0 cc. (as specified) repeated twice at intervals of 3 or 4 weeks for immunization.

Alum Precipitated Diphtheria Toxoid.—Dose: Hypodermic, 0.5 or 1.0 cc. (as specified) repeated once after 4 to 6 weeks for immunization.

Diphtheria and Tetanus Toxoids—(Combined Diphtheria and Tetanus Toxoids).—Dose: Hypodermic, 0.5 or 1.0 cc. (as specified) repeated twice at intervals of 3 or 4 weeks for immunization.

Alum Precipitated Diphtheria and Tetanus Toxoids—(Combined Diphtheria and Tetanus Toxoids, Alum Precipitated).—Dose: Hypodermic, 0.5 or 1.0 cc. (as specified) repeated once after 4 to 6 weeks for immunization.

Diphtheria Toxoid and Pertussis Vaccine Combined.—Dose: Hypodermic, three repeated injections containing the dose of the toxoid and vaccine for immunization.

Tetanus Toxoid.—Dose: Hypodermic, 0.5 or 1.0 cc. (as specified) repeated twice at intervals of 3 or 4 weeks for immunization.

Alum Precipitated Tetanus Toxoid.—Dose: Hypodermic, 0.5 or 1.0 cc. (as specified) repeated once after 4 to 6 weeks for immunization.

Vaccines

Cholera Vaccine.—Dose: Hypodermic, 0.5, 1.0, and 1.0 cc. at intervals of 7 to 10 days for immunization.

Pertussis Vaccine.—Dose: Hypodermic, 60,000 million bacteria in three repeated doses for immunization.

Alum Precipitated Pertussis Vaccine.—Dose: Hypodermic, 30,000 million bacteria in three repeated doses at 4- to 6-week intervals for immunization.

Plague Vaccine.—Dose: Hypodermic, 0.5, 1.0, and 1.0 cc. at 7- to 10-day intervals for immunization.

Rabies Vaccine.—Dose: Hypodermic, one package, repeated at proper intervals.

Smallpox Vaccine.

Typhoid Vaccine.—Dose: Hypodermic, 0.5 cc. repeated twice at intervals of 7 to 28 days for immunization.

Typhoid and Paratyphoid Vaccine.—Dose: Hypodermic, 0.5 cc. repeated twice at intervals of 7 to 28 days for immunization.

Epidemic Typhus Vaccine—(Typhus Vaccine).—Dose: Hypodermic, 1.0 cc. repeated once in 7 to 10 days for immunization.

Tuberculin

Old Tuberculin—(Tuberculin-Kock, Concentrated Tuberculin, Crude Tuberculin).—Dose: Diagnostic, intracutaneous one 100 thousandth to one 10 thousandth cc.; therapeutic, subcutaneous, one 100 millionth to one millionth cc.

Purified Protein Derivative of Tuberculin—(P. P. D.).—Dose: Diagnostic, two 100 thousandths to two 10 thousandths mg.

Serums

Antimeningococcic Serum—(Meningitis Serum, Meningococcus Serum).—Dose: Parenteral, therapeutic, 20 cc.

Antipneumococcic Serum—Type Specific (Pneumonia Serum).—Dose: Parenteral, therapeutic, 20,000 to 100,000 units.

Human Measles Immune Serum—(Measles Convalescent Serum).—Dose: Parenteral, therapeutic, 20 cc., prophylactic, 10 cc.

Human Scarlet Fever Immune Serum—(Scarlet Fever Convalescent Serum).—Dose: Parenteral, therapeutic, 20 cc.; prophylactic, 10 cc.

Normal Human Serum.—The sterile serum obtained by pooling equal amounts of the liquid portion of coagulated blood from eight or more individuals free from disease transmitted by blood transfusion at the time of drawing the blood. It is marketed as a liquid or dried serum. Dose: Intravenous, 500 cc.

Immune Serum Globulin (Human)—(Human Immune Globulin, Measles Prophylactic).—A sterile solution of Gamma Globulin which contains the antibodies normally present in adult human blood. Each lot is derived from the plasma or serum pool of at least 500 individuals. It is transparent or slightly opalescent, colorless, or brownish liquid. Dose: Intramuscular, for modification of measles, 0.02 to 0.025 cc. per pound of body weight; for prevention of measles, 0.1 cc. per pound of body weight.

Normal Human Serum Albumin—Albuminum Seri Humanum Normale.—A sterile solution of the serum albumin component of blood from healthy donors. It complies with the official requirements of the National Institutes of Health of the United States Public Health Service. A moderately viscous, clear, brownish, odorless liquid.

Caution:—Do not use if turbid by transmitted light. Dose: Intravenous, 25 gm. (100 cc. of 25 percent solution).

CALCIUM SALTS

The calcium ion is present in the extracellular fluid. The blood serum in a healthy man contains about 10 mg. of Ca per 100 cc. The average adult requires about 0.45 gm. of Ca daily. A deficiency of calcium in the blood results in a

hyperirritability of the muscle fibers and nerve centers, and a lessening of the contractile power of the muscles. The heart beat becomes weaker and more rapid, violent convulsions may occur, and there is delay in the coagulation of the blood. If the cause of the deficiency is prolonged, the blood will compensate by withdrawing calcium from the bone.

Action.—Abnormal quantities of calcium in the blood result in an increase in the tone and systole of the heart, a lessening of the irritability on the nerve and muscle fibers, and a hastening of clotting of the blood.

Calcium is used in the treatment of various bone diseases, such as rickets, tetany, and osteomalacia, during pregnancy and lactation, and to hasten clotting of blood. It is usually supplemented with phosphorus and vitamin D.

Dibasic Calcium Phosphate—Calcii Phosphas Dibasicus, $\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$ (Dicalcium Orthophosphate, Dicalcium Phosphate).—Dibasic Calcium Phosphate is claimed to be superior to other calcium salts in the treatment of calcium deficiency because it presents a more favorable calcium-phosphorus ratio. Dose: 1 gm. (15 grains).

DRUGS USED IN THE TREATMENT OF ANEMIAS

Iron.—Iron is essential to life. The body of an adult man contains about 3 gm. About 75 to 80 percent of this amount is present in the hemoglobin in a nonionizable form, the remainder being distributed in other body tissues. The normal daily requirement is about 5 to 8 mg.

Action.—When iron is absorbed from the food, it probably undergoes changes in the intestinal epithelium, enters the blood, and is finally taken up by the liver and stored there. From the liver it is released into the blood stream and utilized by the bone marrow in the formation of hemoglobin and new cells. Blood destruction takes place in the spleen; the iron is gradually given off and taken up again by the liver. The store of iron in the liver, spleen, and other tissues can be utilized to form hemoglobin.

Iron preparations are used to overcome nutritional disturbances. They improve nutrition by increasing the hemo-

globin to normal. They are of particular value in anemias of low color index. Anemia with a color index below 0.6 is an iron deficiency anemia, also known as hypochromic anemia.

Certain Ferric salts are used as styptics because of their astringent action.

Liver Extract—*Extractum Hepatis* (Dry Liver Extract).—A brownish powder, dry, somewhat hygroscopic, containing that thermostable fraction of mammalian livers which increases the number of red blood corpuscles in the blood of persons afflicted with pernicious anemia.

Action.—Liver produces a remarkable and almost immediate improvement in the blood condition in most cases of pernicious anemia. The improvement persists as long as the patient remains on the liver diet. About the fourth or fifth day of therapy, an increase in the number of reticulocytes is noted, and this increase continues until the maximum is reached about the ninth day. At the same time abnormalities of the cells disappear, and there are signs of clinical improvement. The patient feels better, his color improves, nausea disappears, and his intestinal condition is improved.

Liver is also used in other macrocytic anemias, and liver and iron are commonly prescribed in secondary anemias.

Liver is administered orally and parenterally. Dose: 1 U. S. P. unit.

Liver Injection.—Dose: Intramuscular, daily, 1 U. S. P. unit.

Liver Injection Crude.—A sterile solution in Water for Injection of the soluble thermostable fraction of mammalian livers which increases the number of red blood corpuscles in the blood. The potency of Liver Injection Crude is expressed in U. S. P. units (Injectable). It contains either one or two U. S. P. units (Injectable) in each cubic centimeter. Dose: Intramuscular, daily, 1 U. S. P. unit.

Powdered Stomach—*Stomachus Pulveratus* (Dried Stomach).—The dried and powdered defatted wall of the stomach of the hog, *Sus scrofa* var. *domesticus* (Fam. *Suidae*). It contains factors which increase the number of red blood

corpuscles in the blood of persons affected with pernicious anemia. Its activity is rapidly destroyed when the preparation is suspended in hot liquid.

Action.—The fraction present in the stomach which is capable of increasing the number of red cells in the blood is formed by the combination of two factors: (1) the intrinsic factor, which is present in the glandular layer of the stomach and the gastric juice; (2) the extrinsic factor, which is present in such foods as meats, eggs, milk, liver and wheat germ.

Pernicious anemia is accompanied by disturbance in gastric secretion. It is probable that the disease is due to a deranged gastric function as a result of which the intrinsic factor is not present. Powdered Stomach is prescribed to supply this lack. Its effects are similar to those produced by liver. Occasionally liver and stomach are prescribed in combination. Stomach is also used in the treatment of other macrocytic anemias. Dose: 1 U. S. P. unit daily.

ENDOCRINE PRODUCTS

Posterior Pituitary—Pituitarium Posterius (Pituitary, Hypophysis Sicca).—The cleaned, dried, and powdered posterior lobe obtained from the pituitary body of domesticated animals used as food by man; a yellowish or grayish powder with a characteristic odor, partially soluble in water.

Its activity depends on the presence of two substances; oxytocin, which has ocytotic properties, and pitressin, which has vasodepressor and antidiuretic properties.

Action.—Posterior Pituitary stimulates the uterus. The uterus is more sensitive to the drug during the first 2 weeks of the menstrual cycle and during the progress of pregnancy. Its action on the heart is variable, but it causes a rise in blood pressure by constriction of the capillaries.

It has an antidiuretic effect on the kidneys, said to be due to the presence of a hormone which is concerned with water metabolism. It has a stimulating effect on the intestinal muscles.

Posterior Pituitary is used as an oxytocic, as an antidiuretic in the treatment of diabetes insipidus, and as a stimulant to intestinal peristalsis in abdominal distension following abdominal operations.

Posterior Pituitary Injection.—Dose: Intramuscular, 0.3 cc. (5 min.).

Oxytocin Injection.—A sterile solution in Water for Injection of the oxytocic principle from the posterior lobe of the pituitary body of healthy domesticated animals used for food by man. Dose: Intramuscular, 0.5 cc. (8 min.).

Vasopressin Injection—(Solution Pitressin).—A sterile aqueous solution of the soluble pressor principle of the posterior lobe of the pituitary body of healthy domesticated animals used for food by man.

Action.—It is used to raise blood pressure, to relieve intestinal atony and that of the bladder following surgery, and for its antidiuretic action in diabetes insipidus. Dose: Intramuscular, 0.5 cc. (8 min.).

Anterior Pituitary—Pituitarium Anterius (Pituitary Anterior Lobe).—The dried, partially defatted, and powdered anterior lobe of the pituitary gland of cattle, sheep, or swine. It is free from diluents or preservatives. It is a yellowish gray, amorphous powder of characteristic odor and salty taste. No disagreeable odor, suggestive of putrefaction is present. It is partially soluble in water.

Action.—In addition to its own specific functions, the anterior pituitary gland regulates the activities of other organs of internal secretions, while its own functional activity is dependent on other glands. It secretes six different hormones.

1. *Somatotrophic Hormone*, also known as the growth hormone, which regulates growth. A deficiency will cause pituitary dwarfism, in which the body is small but well developed and the features are small. In some cases the sexual organs are not properly developed. Excessive secretion will cause gigantism, a condition in which the individual is tall but of symmetrical growth, or a condition known as acromegaly, which is characterized by overgrowth of the bones of the hands, feet, face, and thorax. This hormone

is used in the treatment of pituitary dwarfism. It is manufactured under the name of Antuitrin-G.

2. *Gonadotrophic Hormone* or sex hormone, which affects both male and female sexual functions. A deficiency of this hormone in juveniles causes a failure of the development of the sex organs and secondary sex characteristics. In adults the sex organs show retrogressive changes. An excess of secretion causes a tendency toward sexual precociousness and premature puberty. In adults the sex organs tend to atrophy. The gonadotrophic hormone is divided into two parts: (a) the follicle stimulating hormone (FSH); (b) the luteinizing hormone (LH). In females the FSH stimulates the maturation of the ovarian follicles and the LH hastens luteinization and production of progesterone. In males the FSH induces spermatogenesis and development of the seminiferous tubules in the testes. The LH stimulates the production of testosterone.

A gonadotrophic hormone resembling that of the anterior pituitary is also found in urine of pregnant women and mares, and is believed to originate in the chorionic cells of the placenta. This hormone is marketed as Chorionic Gonadotrophic Hormone, or antuitrin-S. It is used in the treatment of cryptorchidism, sexual infantilism, functional dysmenorrhea, amenorrhea, and menorrhagia.

3. *Lactogenic Hormone*, also called prolactin or luteotrophin, which has to do with the secretion of milk by fully developed mammary glands. It is doubtful whether it has any effect on the development of the gland. It exerts a definite gonadotrophic effect in maintaining the life and function of the corpus luteum. It is used to treat functional uterine bleeding and to stimulate milk production in women who do not show signs of lactation by the sixth day after delivery.

4. *Diabetogenic Hormone* or ketogenic hormone, which controls the blood sugar level. A hypersecretion may cause an increase in blood sugar and in ketone bodies in the urine. It is possible that it is antagonistic to insulin.

5. *Thyrotrophic Hormone* or *Thyrotrophin*.—A lack of this hormone results in atrophy of the thyroid gland. An excess

causes marked hyperplasia of the thyroid, an increase in the basal metabolic rate, and symptoms of hyperthyroidism. It is marketed as Thyrotrophic Factor and is used in the treatment of thyroid hypofunction of pituitary origin.

6. *Corticotrophic or Adrenotrophic Hormone*, also known as corticotrophin, which prevents atrophy of the adrenal cortex and on which the functional activity and structural integrity of the adrenal cortex depend.

The individual hormones are more effective for therapeutic use than the whole gland.

Desoxycorticosterone Acetate—Desoxycorticosteroni Acetas (Deoxycostone Acetate, Cortate, Doca, Precortate).—The adrenal gland is also known as the adrenal body, adrenal capsule, and suprarenal body. It is a flattened body situated behind the peritoneal tissue at the upper end of each kidney. It consists of an internal medulla and an external cortex. The medulla secretes the hormone epinephrine, which is discussed under sympathomimetic drugs. The cortex secretes the hormone desoxycorticosterone.

Action.—A deficiency of the adrenal cortex hormones results in a condition known as Addison's disease, characterized by a disturbance in the sodium and potassium balance in the body fluids. There is a loss in sodium ion and an increase in potassium ion. The carbohydrate metabolism is altered, the blood sugar level is lowered, and the mechanism which adjusts the body to heat and cold is disturbed. Muscular weakness is present and the pigmentation of the skin is bronzelike.

An excessive secretion of this hormone causes Cushing's disease, characterized by degeneration of the red blood corpuscles.

Desoxycorticosterone is used in the treatment of Addison's disease and in conditions of muscular weakness. It is administered by intramuscular injection and subcutaneous implantation.

Desoxycorticosterone Acetate Pellets.

Thyroid—Thyroideum.—The cleaned, dried, and powdered thyroid gland obtained from domesticated animals used for human food, previously deprived of connective

tissue and fat. It contains 0.17 to 0.23 percent of iodine in inorganic or any form of combination other than that peculiar to the thyroid gland. A desiccated thyroid of higher iodine content may be brought to this standard by admixture with a desiccated thyroid of a lower iodine content or with lactose, sodium chloride, starch, or sucrose. Thyroid is a yellowish to buff colored, amorphous powder, having a slight, characteristic, meatlike odor, and a saline taste.

The active constituent is the hormone thyroglobulin, which is an iodine containing globulin, yielding thyroxin upon hydrolysis.

Action.—The primary action of the thyroid is on the metabolic rate, or “calorigenic action.” In the presence of thyroid, cells metabolize faster. Thyroid is intimately related to other endocrine glands such as the anterior pituitary, gonads, and parathyroid. A deficiency of secretion may cause such conditions as myxoedema, cretinism, menstrual disorders, and a low basal metabolic rate. Hypersecretion causes exophthalmic or toxic goiter.

Normal thyroid function depends on an adequate intake of iodine. A deficiency may cause excessive growth and enlargement of the gland, or simple goiter. The basal metabolic rate is not lowered. Administration of iodine will prevent occurrence of simple goiter.

Thyroid is used in the treatment of adult and juvenile myxoedema, cretinism, menstrual disorders, obesity (where it should be used with caution), and certain bone and skin diseases. Thyroid is one of the few endocrine glands which is active after oral administration. Dose: 60 mg. (1 grain).

Thyroid Tablets.—Dose: 60 mg. (1 grain).

Parathyroid Injection—*Injectio Parathyroidei* (Parathyroid Solution, Parathyroid Extract).—A sterile solution in Water for Injection of the water soluble principle or principles of the parathyroid glands which have the property of relieving the symptoms of parathyroid tetany and of increasing the calcium content of the blood serum in man and other animals. It is obtained from the fresh parathyroid

glands of healthy domesticated animals used as food by man, the animal source of each preparation being stated.

Action.—One cc. of Parathyroid Injection possesses a potency of not less than 100 U. S. P. parathyroid units, each unit representing one one-hundredth of the amount required to raise the calcium content of 100 cc. of blood serum of normal dogs 1 mg. within 16 to 18 hours after administration.

A deficiency of parathyroid secretion will cause a lowering of the blood calcium level and symptoms of calcium deficiency. Parathyroid Injection is employed as a specific in the treatment of this condition. A proper diet is essential during this therapy. It is also used in the treatment of chronic lead poisoning, to aid in the elimination of lead from the bones. Dose: Intramuscular, 25 U. S. P. units.

Prophylthiouracil.

Action.—Prophylthiouracil is an antithyroid drug which interferes with the formation of thyroxin by the thyroid gland. It is used in the treatment of hyperthyroidism, thyrotoxicosis, and thyroiditis.

Toxicology.—The toxicity is much less than that of the older drug thiouracil, although there is still some danger in its use. The most serious toxic manifestations are granulocytopenia, leukopenia, drug rash, and fever. Dose: 50 mg. ($\frac{3}{4}$ grain).

Prophylthiouracil Tablets.—Dose: 50 mg. ($\frac{3}{4}$ grain).

Estrogenic Hormone

The estrogenic hormone, or estrin, is present in the follicular fluid. It is a female sex hormone and is capable of producing sexual activity. It is responsible for the development of sex organs at puberty and for the development and maintenance of secondary sex characteristics. The term "estrogen" does not refer to a specific substance but to a group of compounds having actions in common. These include estrone, estradiol, and stilbestrol. In high concentrations in the body they suppress the activity of the anterior pituitary and inhibit the production of the gonadotrophic

hormone. In man, they inhibit the normal function of the testes and may cause abortion. They have a marked effect on calcium metabolism and may cause hypercalcemia.

Estrogens are used in the treatment of menopause, gonorrheal vaginitis in children, senile and juvenile vaginitis, and to suppress lactation.

Estradiol—Estradiol (Dihydrotheelin, Oestradiol).—White or slightly yellow small crystals or crystalline powder, odorless, stable in air, insoluble in water, soluble in alcohol, and sparingly soluble in vegetable oils. It is administered orally. Dose: 0.2 mg. ($\frac{1}{500}$ grain).

Estradiol Tablets.—Dose: 0.2 mg. ($\frac{1}{500}$ grain).

Estradiol Benzoate—Estradiolis Benzoas (Oestradiol Monobenzoate).—Dose: Intramuscular 1 mg. ($\frac{1}{60}$ grain).

Estradiol Benzoate Injection.—Dose: Intramuscular, 1 mg. ($\frac{1}{60}$ grain).

Estrone—Estronum (Theelin).—One of the most active of the estrogens. Dose: Intramuscular, 1 mg. ($\frac{1}{60}$ grain).

Estrone Injection.—Dose: Intramuscular, 1 mg. ($\frac{1}{60}$ grain).

Diethylstilbestrol—Diethylstilbestrol (Stilbestrol).—A synthetic estrogen, more potent than estrone when given orally, less active than estradiol when given parenterally. Dose: 0.5 mg. ($\frac{1}{120}$ grain).

Diethylstilbestrol Capsules.—Dose: 0.5 mg. ($\frac{1}{120}$ grain).

Diethylstilbestrol Tablets.—Dose: 0.5 mg. ($\frac{1}{120}$ grain).

Diethylstilbestrol Injection.—Dose: 0.5 mg. ($\frac{1}{120}$ grain).

Luteal Hormone

Progesterone, the luteal hormone, is present in the corpus luteum, which is normally formed in the second half of the menstrual cycle, after ovulation has occurred. It is present throughout pregnancy. In the absence of pregnancy, the corpus luteum remains functional for about 2 weeks and then retrogresses.

Action.—During pregnancy progesterone prepares the endometrium for the implantation and nourishment of the fertilized ovum, prepares the mammary glands for lactation,

and suppresses further ovulation. It is used in the treatment and prevention of spontaneous, habitual, or threatened abortion, in the treatment of functional uterine bleeding, and sometimes in the treatment of dysmenorrhea and amenorrhea.

Progesterone—Progestronum (proluton, Progestin).—Dose: Intramuscular, 5 mg. ($\frac{1}{2}$ grain). Is prepared synthetically.

Progesterone Injection.—Dose: Intramuscular, 5 mg. ($\frac{1}{2}$ grain).

Ethisterone—(Anhydrohydroxyprogesterone, Pranone).—Dose: 10 mg. ($\frac{1}{8}$ grain).

Ethisterone Tablets.—Dose: 10 mg. ($\frac{1}{8}$ grain).

Androgens

Androgens are male sex hormones, secreted in the testes. The true testicular hormone is called testosterone. It is necessary for the development of sex organs and the secondary sex characteristics of the male. Androgens are used in the treatment of male climacteric, in the treatment of castrates, and to suppress lactation. They are of some value in the treatment of cryptorchidism and pituitary dwarfism. They are administered orally, sublingually, intramuscularly, by inunction, and by subcutaneous implantation.

Testosterone.—It is used in pellet form for tissue implantation. The number of pellets implanted at one time is governed by the need of the patient, which is determined by the response to testosterone propionate by intramuscular injection.

Testosterone Pellets—(Oreton F).

Testosterone Propionate—Testosteroni Propionas (Oreton, Perandren, Neohombreol).—Dose: Intramuscular, 25 mg. ($\frac{3}{8}$ grain).

Testosterone Propionate Injection.—Dose: Intramuscular, 25 mg. ($\frac{3}{8}$ grain).

Methyltestosterone—Methyltestosteronum (Oreton-M, Metandren).—Dose: Oral, 10 mg. ($\frac{1}{8}$ grain); sublingual, 5 mg. ($\frac{1}{2}$ grain).

Methylestosterone Tablets.—Dose: Oral, 10 mg. ($\frac{1}{8}$ grain); sublingual, 5 mg. ($\frac{1}{2}$ grain).

Insulin

Insulin Injection.—*Injectio Insulini* (Insulin, Insulin Hydrochloride).

Action.—Insulin is the hormone secreted by the islands of Langerhans in the pancreas. It controls the oxidation of carbohydrates and the blood sugar level. A deficiency will cause a rise in blood sugar and other symptoms that characterize diabetes mellitus. The disease can be controlled by injections of insulin, in conjunction with a strict diet.

Hyperinsulinism usually occurs from an overdose of insulin. The blood sugar level is lowered, resulting in such symptoms as hunger, weakness, sweating, staggering, double vision, and rarely convulsions, coma, and death.

Insulin is used in the treatment of diabetes mellitus and diabetic coma; and in cases of impaired nutrition, to increase the weight of the patient; in the treatment of schizophrenia by producing insulin shock.

Protamine Zinc-Insulin Injection.—Protamine insulin is slower of absorption than plain insulin and is preferred in most cases.

Globin Zinc Insulin Injection.—An almost clear colorless liquid. It is insulin modified by the addition of globin hydrochloride and zinc chloride. The product is intermediate between insulin and protamine zinc insulin in its onset and duration of action. It should never be mixed with protamine zinc insulin.

VITAMINS

Vitamins are a group of accessory organic substances existing in most foods in minute amounts in their natural state, which are needed in the diet for metabolism. Their absence results in malnutrition and specific deficiency diseases. Their chemistry is complex and nutritional experimentation is difficult, so our knowledge of them is being continually supplemented and revised.

Vitamins A and E each contain two distinct factors and vitamin B has been fractioned into several factors. It is quite possible that additional vitamins will be discovered

or that some of those already recognized may prove to contain more than one factor.

Vitamins are so widely distributed in foods that a normal diet usually provides an adequate amount. Some are destroyed by the preparation or preservation of certain foods, and as a result the diet needs to be supplemented with specific vitamins. Some manufacturers add vitamins to their products to replace those destroyed or removed in processing.

Vitamin A.—Vitamin A is present in fish liver oils, liver, butter, eggs, cream, yellow vegetables, and fruits. In butter, cream, eggs, and carrots, both vitamin A and provitamin A (Carotene) may be present. Provitamin A is capable of being changed into vitamin A.

Vitamin A is used to remedy such deficiency conditions as night blindness, xerophthalmia, and keratosis of the skin. The daily requirement for a healthy adult is about 5,000 U. S. P. units and for growing children about 6,000 to 8,000 units.

Vitamin B Complex (Vitamin B Complex).—Vitamin B Complex consists of a number of factors, some of which have been identified and synthesized. It is less stable than vitamin A, although some of its constituents can withstand heat for a short time. The best natural sources are rice polishings, yeast, and liver. Other good sources include fruits, meat, milk, and eggs.

Thiamin (Vitamin B₁).—This was the first recognized constituent of vitamin B complex to be isolated in crystalline form. It is the antineuritic vitamin which prevents beriberi and polyneuritis. It is used as a specific for the prevention and treatment of beri-beri. It may also be used in cases of lack of appetite because of dietary disturbance. An increase in Thiamin may be necessary in cases of increased metabolism, as in hyperthyroidism or fevers. The normal daily requirement is 1 to 2 mg.

Riboflavin (Vitamin B₂, Vitamin G, Lactoflavin).—A deficiency of this vitamin causes pellagra, and its principal use is in the treatment of this disease. Improvement occurs

within 24 hours. The average daily requirement is 10 to 40 mg.

Nicotinic Acid (Niacin).—A white crystalline powder, soluble in water and alcohol.

Action.—Nicotinic acid and the amide are important in the treatment of pellagra. Large doses of Nicotinic Acid produces flushing of the face and neck; this reaction being harmless. It is not observed when nicotinamide is used. Dose: 25 mg. ($\frac{3}{8}$ grain).

Nicotinamide—(Niacinamide).—This is the amide of Nicotinic Acid and has the same uses. Dose: Oral, 25 mg. ($\frac{3}{8}$ grain); parenteral, 100 mg. ($1\frac{1}{2}$ grains).

Pyridoxine (Vitamin B₆).—Chemically it is a derivative of pyridine. It appears to be associated with certain neuromuscular conditions and with the utilization of fatty acids, but its value in the treatment of human disease is not yet clearly established. It has been used in the treatment of palsy, muscular atrophy and weakness, agranulocytic angina, and in combination with thiamin to overcome nausea and vomiting in pregnancy. The daily requirement of the normal adult is about 2 mg. It is used in the form of hydrochloride, as injectable solutions or tablets.

Vitamin B₁₂ (BeDodec, Betalin 12, Cobione, Bevidox Crystalline, Rubramin, Dodecavite Crystalline).—A cobalt-containing substance produced by the growth of suitable microbial organisms or obtained from liver. It is a dark red crystalline substance, somewhat soluble in water. It is believed to be the true anti-pernicious anemia factor. Dose: Intramuscular or subcutaneous, daily requirement, 1 microgram, usually administered in 10 to 15 microgram doses at intervals.

Pantothenic Acid—A member of vitamin B complex.—It is also known as the “filtrate” factor and the “chick antidermatitis” factor. Laboratory experiments show that black rats on a Pantothenic Acid deficient diet turn gray and show poor growth, dermatitis and adrenal hemorrhage.

This is not the only antigraying factor, as biotin and inositol share this property, and it is not involved in the graying of hair in human beings. A deficiency of Panto-

thenic Acid in chicks may cause dermatitis. Clinical observations indicate that this factor is necessary in human nutrition. The average daily requirement is 3 to 4 mg. It is marketed as the calcium salt.

Para-Aminobenzoic Acid (Paba).—A member of the vitamin B complex, which is necessary for normal pigmentation of hair and maintenance of coat in the rat, growth in the chick, and multiplication of certain strains of bacteria. Its action in the human body is not clear. It is used to increase the blood level of streptomycin and salicylates. It has been used recently with encouraging results in the treatment of diseases caused by Rickettsia, such as scrub typhus, louse-borne typhus, and Rocky Mountain spotted fever. Dose: 10 gm. (2½ drachms).

Choline.—This member of vitamin B complex is a constituent of lecithin and is chemically associated with acetylcholine. A deficiency in the diet of a mammal gives rise to fatty degeneration of the liver and kidney. It has been used effectively in the treatment of hepatitis and cirrhosis of the liver.

Folic Acid.—This factor of vitamin B complex is present in liver, kidney, yeast, and green leaves. It was found necessary for the growth of the *Lactobacillus casei* and was designated as the "L. casei factor." It was also called vitamin M because its deficiency caused retarded growth, loss of growth, and leukopenia in monkeys, and vitamin Bc because its deficiency in chicks caused macrocytic hypochromic anemia.

Folic Acid has been prepared synthetically. Chemically it is called pteroyl glutamic acid. It has been used very successfully in the treatment of tropical sprue and nutritional, pernicious, and other forms of macrocytic anemia. Its use in leukopenia has also been suggested. Dose: Daily, 10 mg. (¼ grain).

Ascorbic Acid—*Acidum Ascorbicum*, Vitamin C, (Cevitamic Acid).—It exists as two isomers, levo-ascorbic acid, which is the active substance, and dextro-ascorbic, which is physiologically inert. Ascorbic Acid is present in potatoes, citrus fruits, green vegetables, tomatoes, and strawberries. A deficiency causes scurvy and is believed to delay healing

of wounds. The average daily requirement is 30 to 75 mg.

Vitamin D.—It is often called the antirachitic vitamin. It is fat soluble and is present in fish liver oils, egg yolk, milk, and butter. It affects the absorption and utilization of calcium and phosphorus in the body and is used in the prophylaxis and treatment of rickets in children and softening of the bone in adults. It has some relationship with the functions of the thyroid and parathyroid glands. An excessive intake of vitamin D causes a decrease in the amount of calcium and phosphate in the intestinal contents and overcalcification at the growing ends of the bones. The average daily requirement is 400 units.

Vitamin E (Alpha-Tocopherol).—Little is known about the metabolism of this vitamin. Studies show that it is essential for the normal function of the nuclei of all animal cells. It is poorly stored in the body. A deficiency in the male caused degeneration of the testes, and the spermatozoa were nonmotile. In the female, the development of the fetus was retarded after normal implantation had occurred, and death and resorption of the embryo followed. Experiments show that vitamin E deficiency interferes with the balance between the gonadotrophic hormone in the anterior pituitary and the hormones produced by the gonads and also affects the skeletal muscles, resulting in spastic paralysis or muscular weakness.

Vitamin E has been used in cases of sterility and habitual abortion and in muscular weakness and atrophy, but there is little evidence of its value. It is found in wheat germ oil, cottonseed oil, green leafy vegetables, meat, and eggs.

Vitamin K.—(Menadione, Menadione Sodium Bisulfite) is the factor necessary for the maintenance of the normal prothrombin level in the blood. Prothrombin is essential for clotting of the blood. The normal prothrombin level is dependent not only on an adequate amount of vitamin K, but also on the presence of bile and normal bacteria flora in the intestinal tract, normal absorptive activity of the intestinal mucosa, and the presence in the liver of a sufficient number of active cells, which are necessary for the synthesis of prothrombin from vitamin K.

Vitamin K is used in the treatment of obstructive jaundice and in biliary fistulae, where there is a tendency to hemorrhage because of a deficiency of prothrombin in the blood. It is also administered during labor, as a prophylaxis against hemorrhage in the newborn, and in the treatment of physiological hypothermia of the newborn. The average daily requirement for the newborn is about one microgram.

COAGULANTS AND ANTICOAGULANTS

The coagulation of blood consists in the transformation of the dissolved fibrinogen of the circulating blood into insoluble fibrin by the action of thrombin. Fibrinogen is an acid globulin, formed exclusively in the liver. Thrombin is a protein not contained in the circulating blood, but formed from prothrombin by the action of thrombokinase, which requires the calcium ion in the blood.

Thrombin converts 2,000 times its weight of fibrinogen into fibrin. The prevention of coagulation is due to the continuous production of several antistances, especially antithrombin, associated with the albumin fraction, which prevents the action of thrombin on fibrinogen, and antiprothrombin, which keeps prothrombin in inactive combination.

The addition of citrate or oxalate to shed blood prevents coagulation by inactivating the calcium.

Coagulants

Oxidized Cellulose.—A form of cotton or gauze, slightly acid in taste; soluble in dilute alkalis but insoluble in acids or water. It is used as a surgical hemostatic agent, acting as an artificial clot.

Absorbable Gelatin Sponge.—A sterile, absorbable, water insoluble gelatin base sponge. It is used as a hemostatic agent, when saturated with sterile normal saline solution or a thrombin solution. It may be left in the body since it is slowly absorbed.

Thrombin—(Thrombol).—A sterile protein substance prepared from prothrombin of mammalian origin and thromboplastin in the presence of calcium. It is a white or grayish

white, amorphous substance. Before use it is added to sterile normal saline solution, which can be applied topically to arrest capillary bleeding.

Antihemophilic Globulin.—A white or nearly white amorphous substance dried from the frozen state. It is restored with a normal saline solution or sterile water. It is used to shorten the clotting time of hemophilic blood. Dose: Intravenous, 200 mg. protein.

Anticoagulants

Bishydroxycoumarin.—(Dicoumarol, Dicoumarin).

Action.—It is used as an anticoagulant, acting by interfering with prothrombin formation in the liver. It does not produce an immediate effect. Whole blood transfusions and large doses of high potency K-active substance should be given if the prothrombin level drops below 15 percent of normal. This drug should not be employed without the facilities of laboratory control to follow the level of blood prothrombin.

Heparin Sodium—(Heparin).—A mixture of active principles obtained from the liver or lungs of domesticated animals.

Action.—It acts as antiprothrombin and antithrombin in the blood stream, prolonging the clotting time of blood. It is used in the prophylaxis and the treatment of thrombosis, both postoperative and during transfusion. It is usually given by subcutaneous or continuous intravenous injection.

DIAGNOSTIC AGENTS

Barium Sulfate—Barii Sulfas, BaSO_4 .

Caution: When Barium Sulfate is prescribed, the title should always be written out in full to avoid confusion with the poisonous barium sulfide or barium sulfite.

Barium Sulfate is employed in roentgenography for X-rays of the gastrointestinal tract. It is usually administered in water or with a mucilaginous substance. It is opaque to X-rays.

Toxicology of Soluble Barium Salts.—The symptoms are burning pain in the stomach, nausea, vomiting, diarrhea, vertigo, and ringing in the ears, slow and irregular pulse, and possible convulsions. Death may occur in 1 hour or be delayed for some time.

Treatment of the chemical antidote, magnesium or sodium sulfate.

Gastric lavage, symptomatic treatment.

Iodophthalein Sodium.—Iodophthaleinum Sodicum (Soluble Iodophthalein, Tetraiodophthalein Sodium).

Action.—It is used as a diagnostic agent to test the excretory function of the liver and to render the gallbladder opaque to X-ray. Its use in liver tests depends on the fact that when the liver is normal, the dye is eliminated from the blood chiefly through that organ. It is administered either orally or intravenously. All solution for injection should be freshly prepared. Dose: For each 10 kg. of body weight, oral, 0.5 gm. ($7\frac{1}{2}$ grains); intravenous, 0.3 gm. (5 grains).

Sulfobromophthalein Sodium — Sulfobromophthaleinum Sodicum.—It is used to test the functional activity of the liver, being considered more reliable than iodophthalein. It is administered by injection. Dose: For each kilogram of body weight, intravenous, 2 mg. ($\frac{1}{50}$ grain).

Phenolsulfonphthalein—Phenolsulfonphthaleinum (Phenol Red).—It is used in renal function tests. It is administered intramuscularly or intravenously. The official injection is prepared by using sodium bicarbonate or sodium hydroxide as a solvent. Dose: Intravenous or intramuscular, 6 mg. ($\frac{1}{10}$ grain).

Iodopyracet Injection—Injectio Iodopyraceti (Diodrast Sterile Solution).—Used as a contrast medium in intravenous urography.

Congo Red.—A dark red or reddish brown powder, soluble in water and slightly soluble in alcohol.

Congo Red Injection.—It is used in the diagnosis of amyloidosis.

Action.—Injected intravenously into normal subjects, it is retained in the blood stream much longer than when injected into the blood stream of a patient with type II nephritis and

amyloidosis. In the case of type II nephritis, the dye passes through the kidney into the urine. In amyloidosis the dye is absorbed by the amyloid tissues.

Iodoalphionic Acid.

Action.—It is given orally for the delineation of the gall-bladder in cholecystography. The patient is directed to eat a light, fat-free meal on the afternoon of the day preceding the examination. It should not be given patients having nephritis, uremia, or acute gastrointestinal disorders. Dose: 3 gm. (45 grains).

Iodoalphionic Acid Tablets (Priodax Tablets).—Dose: 3 gm. (45 grains).

Methiodal Sodium (Skiodan).—It is used for intravenous urography and retrograde pyelography.

Methiodal Sodium Injection.

Sodium Iodomethamate (Neo-Iopax).—Used as a contrast medium in intravenous urography and retrograde pyelography. Dose: Intravenous, 10 gm. (2½ drachms).

Sodium Iodomethamate Injection.

Iodized Oil—Oleum Iodatum.—Used as a contrast medium in roentgenography.

Fluorescein Sodium—Fluoresceinum Sodicum (Soluble Fluorescein, Resorcinolphthalein Sodium).—Used as a diagnostic agent in ophthalmology to delineate corneal ulcerations and foreign bodies. When a solution is applied to the cornea, ulcerated areas are stained green, foreign bodies appear surrounded by a green ring, loss of substance in the conjunctiva is shown by a yellow stain.

POISON ANTIDOTES

Dimercaptol (BAL).

Dimercaptol Injection—(BAL Injection).—A sterile 10 per cent solution of Dimercaptol in oil.

Action.—It is a valuable antidote for heavy metal poisoning, particularly useful in treating acute and chronic poisoning due to mercury, arsenic, and lead. Its action is based on the formation of a stable compound with heavy metals by reason of the affinity between the metals and the sulfahydryl groups of the Dimercaptol.

INSTRUCTION TEST

Assignment No. 6

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. The amount of drug just sufficient to cause death is termed the dose.
2. It is sometimes very difficult to diagnose poisoning because the symptoms often resemble those of certain
3. Detection and diagnosing of acid poisoning may be aided by the resulting produced on the body or clothing.
4. The first step in treating an acid poisoning is to neutralize the acid with a nontoxic
5. The three classes of antidotes are mechanical,, and
6. Heat should not be used to dissolve sodium bicarbonate because a is formed which produces an irritant effect similar to alkalies.
7. Magnesium trisilicate is one of the newer gastric and adsorbents used in the treatment of ulcers.
8. Care must be taken not to give an overdose of apomorphine, as it has a central nervous system effect and may produce collapse or death.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

9. Peppermint oil is an excellent
 1. emetic
 2. emodin cathartic
 3. gastrointestinal stimulant
 4. demulcent.....
10. Apomorphine hydrochloride is most effective when given
 1. parenterally
 2. orally
 3. rectally
 4. sublingually.....
11. The chief use of emetine is as
 1. an expectorant
 2. an emetic
 3. a diaphoretic
 4. an amebacide.....

12. Which of the following drugs produces emesis due to its stimulating effect on the vomiting center in the medulla?
 1. Tartar emetic
 2. Apomorphine hydrochloride
 3. Ipecac
 4. Cephaeline -----
13. When the kidneys are incapable of responding to diuretic action, particularly in certain inflammatory and diseased conditions such as nephritis, diuretics should
 1. be employed with caution
 2. be given indiscriminately in large doses
 3. be given every 2 hours
 4. not be used -----
14. Potassium is a universal depressant affecting the circulation and the
 1. heart
 2. lungs
 3. central nervous system
 4. hepatic system -----
15. The first symptom of lead poisoning is
 1. a persistent sour metallic taste
 2. a persistent sweet metallic taste
 3. a persistent garlic taste
 4. a persistent acid taste -----
16. One of the more important diagnostic symptoms in lead poisoning is
 1. the sloughing of the gums
 2. the blistering of the mucous membranes of the mouth
 3. the blue line on the margin of the gums
 4. the bright red line on the margin of the gums -----
17. Besides being used for its salt action as a cathartic, which one of the following drugs is frequently employed as an anticonvulsant because the magnesium ion acts as a depressant to the central nervous system?
 1. Magnesium iodide
 2. Magnesium oxide
 3. Magnesium silicate
 4. Magnesium sulfate -----
18. The therapeutic uses of citrates are as diuretics, diaphoretics, expectorants, and
 1. systemic alkalinizers
 2. emetics
 3. cathartics
 4. digestants -----

INSTRUCTION TEST

Assignment No. 7

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. Aluminum phosphate gel has less combining power than aluminum hydroxide gel, but it has the advantage of being capable of
2. Oxides and hydroxides have the power to neutralize and dissolve
3. The symptoms of alkali poisoning are pain in the throat and, with nausea and
4. In alkali poisoning the mucous membrane of the mouth is and swollen, often brownish in color.
5. When treating a person with alkali poisoning a or emetic should never be used.
6. Milk of magnesia is a suspension of magnesium hydroxide containing 7 to percent of $Mg(OH)_2$.
7. Carbonates produce their antacid effect by reacting with the acid, liberating
8. The insoluble salts of bismuth are used chiefly in the treatment of and inflammation of the tract.
9. Prepared chalk is an effective gastric antacid and is also very effective in the treatment of
10. Aluminum hydroxide gel acts as a protective and to the tract.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

11. "Tartar emetic" is chiefly prescribed as a
 1. mild expectorant
 2. mild cathartic
 3. nauseating expectorant
 4. drastic cathartic.....
12. Vesicants form blisters when the irritation has caused a wide dilation of the
 1. arteries
 2. capillaries
 3. veins
 4. lymphatic trunks.....

13. Which of the below listed drugs is an ideal emetic due to the promptness of the emesis?
1. Zinc sulfate
2. Zinc oxide
3. Aluminum sulfate
4. Ipecac -----
14. Methocel, a white fibrous material, is classified as
1. an emodin cathartic
2. a resinous cathartic
3. a saline cathartic
4. a hydrophilic laxative -----
15. An increase of potassium in the body may cause an increase of bronchial secretions and
1. catharsis
2. diathesis
3. diaphoresis
4. dipsosis -----
16. The diuretic action of the organic mercurials is increased by the addition of
1. picrotoxin
2. mannitol hexanitate
3. sodium thiocyanate
4. theophylline -----
17. Urea, an active diuretic, used in the treatment of cardiac edema and chronic nephrosis is administered
1. orally with fruit juices, iced drinks or flavored syrups
2. orally in capsules
3. intramuscularly
4. intravenously -----
18. Sucrose should be administered cautiously when used as a diuretic, as it may cause severe
1. venous injury
2. cardiac injury
3. renal injury
4. hepatic injury -----

MATCHING ITEMS

To the right of each phrase or symbol in list B write the number of the one most closely related item in list A.

19. Match the following named drugs with their common trade names or synonyms.

A	B	
1. zinc sulfate	Burow's solution	-----
2. dehydrocholic acid	tartar emetic	-----
3. magnesium oxide	milk of magnesia	-----
4. magnesia magma	decholin	-----
5. bismuth subcarbonate	white vitriol	-----
6. antimony potassium tartrate		
7. aluminum acetate solution		

20. Match the following drugs with their trade names or synonyms.

A	B	
1. mercurphylline	mercurhydrine	-----
2. meralluride	carbamide	-----
3. mersalyl	salyrgan	-----
4. urea	dextrose	-----
5. d-glucose	mercurzanthin	-----
6. saccharin		
7. salol		

INSTRUCTION TEST

Assignment No. 8

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. Rennin is used chiefly in the preparation of ----- and convalescent foods.
2. Bile salts is used as a choloretic to promote absorption of vitamin K in the treatment of ----- insufficiency.
3. Emodin cathartics have little effect on the upper bowels, but they produce catharsis by prompting peristalsis of the -----.
4. Plantago seed contains a large amount of ----- and swells in the intestines to form an ----- emollient mass.
5. Aluminum hydroxide is used in the treatment of gastric hyperacidity and peptic -----, and for intestinal toxemia as an adsorbent for bacteria, gases or -----.
6. Resinous cathartics cause considerable griping and are capable of setting up a ----- of sufficient violence to threaten life.

7. Large doses of podophyllin resin causes watery stools tinged with -----
8. Resin of podophyllin has been shown by recent clinical trials to be effective in the treatment and removal of ----- warts.
9. Phenolphthalein acts by its local ----- effect and by direct motor stimulation of the intestines, but its greatest effect is produced on the -----.
10. Bulk cathartics are divided into saline cathartics and ----- cathartics.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

11. The dose of croton oil which is official in the N. F. VII is
 1. 1 minim
 2. 1 cc.
 3. 1 ounce
 4. 1 dram
12. The color of the stain produced by the corrosive action of nitric acid on the skin or mucous membranes is
 1. brown
 2. black
 3. deep yellow
 4. light yellow
13. Alkali carbonates are never administered in the treatment of acid poisoning because of the adverse effect produced by the formation of
 1. carbon monoxide
 2. carbon dioxide
 3. carbon tetrachloride
 4. carbonic acid
14. Physiological antidotes are usually administered
 1. rectally
 2. sublingually
 3. orally
 4. hypodermically
15. In poisoning with sulfuric acid, the vomitus is usually
 1. brown and tarry
 2. yellow and bloody
 3. black and tarry
 4. black and bloody

16. On the skin and mucous membranes, nitrohydrochloric acid produces a
1. light yellow stain
 2. dark stain
 3. brown stain
 4. white stain
17. The average therapeutic dose of milk of magnesia as a laxative is
1. 4 cc.
 2. 10 cc.
 3. 15 cc.
 4. 30 cc.
18. In lead colic, the removal of the poison is accomplished by administration of
1. sodium chloride
 2. magnesium sulfate
 3. potassium permanganate
 4. sodium citrate

MATCHING ITEMS

To the right of each phrase or symbol in list B write the number of the one most closely related item in list A.

19. Match the following drugs with their chemical formulae.

A	B
1. NaHCO_3	prepared chalk
2. MgO	magnesium sulfate
3. Na_2CO_3	sodium bicarbonate
4. CaCO_3	sodium sulfate
5. Na_2SO_4	magnesium oxide
6. MgSO_4	

20. Match the following drugs with their trade names or synonyms.

A	B
1. magnesium citrate solution	sacred bark
2. podophyllum	lye
3. potassium hydroxide	lemon purgative
4. podophyllin	mandrake
5. cascara sagrada	

INSTRUCTION TEST

Assignment No. 9

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. Barbiturates are detoxified by the and excreted by the kidney.
2. The barbiturates are used as and sedatives, as anti-convulsants and as anesthetics for short or anesthesia.
3. Poisoning by barbiturates is characterized by deep sleep and
4. Picrotoxin is used as a antidote in barbiturate poisoning.
5. Bromides given in small doses affect the area of the cerebrum.
6. Bromides are not true somnifacients but induce by lessening the activity of perception of sense stimuli.
7. Poisoning by bromides is characterized by-like eruption of the skin, breath, occasional mental confusion, and weakness.
8. The treatment of bromide poisoning consists of complete withdrawal of the drug, large doses of chloride, and symptomatic treatment.
9. Systemically, alcohol is used in the treatment of, as a digestive stimulant, and as a
10. The most important glucosides of "Fox glove" are digitoxin, gitoxin, and

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

11. Which of the following drugs is the anticonvulsant of choice in the treatment of epilepsy?
 1. Seconal sodium
 2. Dilantin sodium
 3. Pentothal sodium
 4. Barbital sodium.....
12. The average dose of trimethadione as an anticonvulsant is
 1. 1.5 gr.
 2. 10 gr.
 3. 15 gr.
 4. 30 gr......

13. A therapeutic dose of chloral hydrate will usually produce sedation in
1. 10 to 15 minutes
 2. 15 to 20 minutes
 3. 20 to 25 minutes
 4. 25 to 30 minutes
-
14. One of the symptoms not associated with chloral hydrate poisoning is
1. deep stupor
 2. slow respiration
 3. cyanosis
 4. marked vasoconstriction
-
15. The therapeutic use of alcohol when injected in or near a nerve is considered as a
1. rubefacient
 2. counterirritant
 3. local anesthetic
 4. hypnotic
-
16. Drugs used for their ability to increase the volume of bile are known as
1. vasoconstrictors
 2. cholagogues
 3. central nervous system stimulants
 4. diaphoretics
-
17. In therapeutic doses, digitalis causes
1. an increase in the force of the diastolic beat
 2. a decrease in the force of diastolic beat
 3. a decrease in the force of the systolic beat
 4. an increase in the force of the systolic beat
-
18. One (1) U. S. P. unit of digitalis is equivalent to
1. 0.1 gm. of powdered digitalis U. S. P.
 2. 0.2 gm. of powdered digitalis U. S. P.
 3. 0.6 gm. of powdered digitalis U. S. P.
 4. 0.9 gm. of powdered digitalis U. S. P.
-
19. Strophanthin is given a patient when
1. slow digitalization is indicated
 2. quick digitalization is indicated
 3. moderate digitalization is indicated
 4. a longer duration of digitalization is indicated
-
20. Which of the below listed symptoms is not characteristic of digitalis poisoning?
1. Nausea and vomiting
 2. Visual disturbances
 3. Diarrhea
 4. Muscular weakness
-

INSTRUCTION TEST

Assignment No. 10

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. Morphine is a narcotic, depressing activity, and producing and sleep.
2. Paraldehyde is a hypnotic and, producing normal sleep without after-effects.
3. The symptoms of opium poisoning are deep sleep and, depressed respiration, pupils, cyanosis, suppressed urine, low body temperature, and cold, clammy skin.
4. In the treatment of coronary thrombosis and angina pectoris, theocin is used as a
5. Metrazol is used in the shock therapy of disorders.
6. Strychnine is a valuable stimulant, used in the treatment of poisonings by central nervous system
7. Histamine phosphate is used as a diagnostic agent in function tests.
8. Histamine poisoning is usually the result of an error in
9. Paraldehyde has a wide margin of, and although large doses may cause prolonged, fatalities are rare.
- 10. Barbitol acts very slowly and should be given about hours before sleep is desired.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

11. The most important pharmacological action of the nitrites is
 1. to lower the blood pressure
 2. to raise the blood pressure
 3. to increase respiration
 4. to decrease respiration.....
12. The chief use of amyl nitrite is in the treatment of
 1. serum sickness
 2. asthma
 3. coronary occlusion
 4. angina pectoris.....

13. In the diagnosis of strychnine poisoning, one of the outstanding symptoms is
1. wrist drop
 2. a pleasant grin
 3. a sardonic grin
 4. a slow reflex action
14. Picrotoxin (Cocculin) is a powerful central nervous stimulant resembling the action of
1. barbital
 2. paraldehyde
 3. brucine
 4. strychnine
15. A quick-acting barbiturate administered intravenously to control convulsions in strychnine poisoning is
1. amytal sodium
 2. phenobarbital
 3. barbital
 4. procaine
16. Nitroglycerin tablets, taken orally, act so rapidly that the blood pressure drops within
1. 0 to 1 minute
 2. 1 to 2 minutes
 3. 2 to 3 minutes
 4. 3 to 4 minutes
17. One drug never used in the treatment of strychnine poisoning because it is a stimulant to the spinal cord is
1. morphine
 2. chloral hydrate
 3. paraldehyde
 4. tribromaethanol
18. Only one dose of atropine should be administered in the treatment of opiate poisoning and that dose should not exceed
1. 0.1 mg.
 2. 1.0 mg.
 3. 1.5 mg.
 4. 2.0 mg.
19. A drug used as a respiratory stimulant in opium poisoning is
1. whisky
 2. coramine
 3. dilantin sodium
 4. sodium bromide

MATCHING ITEMS

To the right of each phrase or symbol in list B write the number of the one most closely related item in list A.

20. Match the following drugs with their common trade name or synonym.

A	B
1. glyceryl trinitrate tablets	cocculin
	theine
2. pentobarbital sodium	nitroglycerin tablets
	nembutal
3. picrotoxin	
4. thiopental sodium	
5. caffeine	

INSTRUCTION TEST

Assignment No. 11

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. Dionin is prepared synthetically from and is used as a sedative and analgesic.
2. Cholinesterase is an enzyme present in the and tissues which splits acetylcholine into and acetic acid.
3. Methacholine chloride is used in the treatment of auricular paroxysmal and of abdominal due to post-operative intestinal ileus.
4. Pilocarpine nitrate is used as a myotic in the treatment of and other diseases of the eye.
5. Adrenalin the blood vessels of the skin and mucosa after local application or injection of the drug.
6. Papaverine is used in the treatment of peripheral or pulmonary arterial
7. Pilocarpine is a physiological antidote for poisoning caused by
8. Carbachol is used to relieve retention following labor and abdominal due to postoperative intestinal ileus.
9. Homatropine hydrobromide is used only in ophthalmology as a
10. Ergotamine tartrate is a valuable drug used for relieving headache.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

11. One of the symptoms *not* associated with pilocarpine poisoning is
 1. intestinal disturbances
 2. visual disturbances
 3. violent peristalsis
 4. nausea and vomiting
12. Epinephrine is used in conjunction with *spinal* anesthesia to
 1. control hemorrhage
 2. prolong the action
 3. maintain blood pressure
 4. relieve serum reactions
13. Amphetamine is contraindicated in cases of
 1. hypotension
 2. cardiovascular disease
 3. obesity
 4. narcolepsy
14. Diphenhydramine reduces bronchoconstriction produced by
 1. histamine
 2. gynergin
 3. stramonium
 4. amphetamine
15. Oxytocics or ecbolics are drugs which produce rhythmic contractions of the
 1. pupil of the eye
 2. cardiac muscle
 3. uterus
 4. intestines
16. Salicylates are used as analgesics and
 1. antipyretics
 2. antihistamines
 3. sedatives
 4. diuretics
17. A symptom *not* associated with salicylism is
 1. headache
 2. thirst
 3. gastrointestinal disturbances
 4. epistaxis
18. The therapeutic dose of pyribenzamine is
 1. 15 mg.
 2. 25 mg.
 3. 50 mg.
 4. 75 mg.

19. Colchicine is used in the treatment of

1. dyspepsia
2. gout
3. constipation
4. nephritis

MATCHING ITEMS

To the right of each phrase or symbol in list B write the number of the one most closely related item in list A.

20. Match the following drugs with their common trade names.

A	B
1. tripelenamine hydrochloride	desoxyephedrine -----
2. methamphetamine hydrochloride	benzedrine sulfate -----
3. hyoscyamus	tablets -----
4. scopolamine hydrobromide	benadryl -----
5. diphenhydramine hydrochloride capsules	pyribenzamine -----
6. racephedrine hydrochloride	henbane -----
7. amphetamine sulfate	veronal -----
8. barbital	

INSTRUCTION TEST

Assignment No. 12

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. Coal tar analgesics resemble the ----- in action but salicylates differ in chemical -----.
2. The most outstanding characteristic of acetanilid poisoning is -----.
3. In poisoning by antipyrine and aminopyrine, the symptoms are similar to ----- poisoning except that ----- does not occur.
4. Ether is a popular anesthetic although its ----- of action and ----- effect are undesirable features.
5. As an anesthetic, chloroform is less ----- than ether, but in most cases it is decidedly more -----.

6. As a general anesthetic, ethyl chloride is used only for operations of short duration because of the of its action.
7. Cyclopropane is more pleasant than ether because there is no irritation and laryngospasm, and no respiratory with deep surgical anesthesia.
8. Chloroform is less than ether and is used mostly in warmer climates.
9. Care should be taken not to vaporize chloroform near a naked flame because of the production of gases.
10. Cocaine penetrates the membrane rather readily and is used only by topical application.
11. The symptoms of acute cocaine poisoning are quickened respiration and pulse rate, excitement, pupils, dry throat, headache, vertigo, confusion, and convulsions.
12. Phenocaine is more than cocaine because it is not readily in the body.
13. Pontocaine is used for surface anesthesia in the eye,, and throat, and in anesthesia in which the anesthesia is prolonged.
14. Cocaine is never administered by because it is a general protoplasmic poison.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

15. When avertin is administered for basal anesthesia, the patient usually falls asleep within
 1. 0 to 2 minutes
 2. 2 to 5 minutes
 3. 5 to 15 minutes
 4. 15 to 20 minutes
16. Which of the below listed drugs is used for caudal anesthesia?
 1. Holocaine
 2. Amylene hydrate
 3. Butocaine sulfate
 4. Metycaine hydrochloride
17. Cocaine is seldom used in the treatment of the eye because of its harmful effect on the
 1. cornea
 2. rods
 3. retina
 4. aqueous humor

18. For basal anesthesia, tribromoethanol is administered

1. intravenously
2. subcutaneously
3. rectally
4. orally

19. Vinyl ether is used for anesthesia of

1. intermediate duration
2. short duration
3. long duration
4. exceptionally long duration

MATCHING ITEMS

To the right of each phrase or symbol in list B write the number of the one most closely related item in list A.

20. Match the following drugs with their chemical formula.

A	B
1. $C_2H_5.O.C_2H_5$	chloroform
2. CH_3Cl	cyclopropane
3. $(CH_2)_3$	tribromoethanol
4. $Br_3C.CH_2OH$	ether
5. $CHCl_3$	

INSTRUCTION TEST

Assignment No. 13

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. Phenol precipitates protein and when applied to the skin causes _____ followed by _____ of the tissues.
2. Betanaphthol is a more powerful _____ than phenol and is used locally in the treatment of _____ skin diseases, usually in the form of ointments.
3. Picric acid _____ the red blood cells and causes acute nephritis and _____ damage.
4. Parachlorophenol is used locally for its bactericidal action on Gram— _____ organisms.
5. When benzyl benzoate is administered orally, it is used as an _____ in spasms of the smooth muscle, particularly the _____.
6. Benzalkonium chloride is used in various concentrations as a disinfectant and _____.
7. Oxidizing antiseptics exert a germicidal action by oxidizing the constituents of the bacterial _____.

8. Medicinal zinc peroxide is used in the form of a as a dressing for badly infected wounds, particularly those infected with bacteria.
9. The only simple silver salt which is officially acceptable is
10. The symptoms of silver nitrate poisoning are, convulsions, profound changes in respiration,, and coma.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

11. Undecylenic acid is used as a
 1. fungicide
 2. amebacide
 3. pediculocide
 4. parasiticide
12. Which of the below listed drugs is used in the treatment of psoriasis?
 1. Phenacetin
 2. Nitric acid
 3. Chrysarobin
 4. Undecylenic acid
13. Silver compounds owe their action to the silver ion which precipitates
 1. fats
 2. protein
 3. carbohydrate
 4. hemoglobin
14. As a prophylaxis against gonorrheal conjunctivitis, silver nitrate is applied to the eyes of the newborn in a
 1. 0.5 percent solution
 2. 1.0 percent solution
 3. 1.5 percent solution
 4. 2.0 percent solution
15. To aid in the utilization of iron salts in the body, copper is used in combination with iron as
 1. an astringent
 2. a hemostatic
 3. a hemotinic
 4. a hemolytic

16. Picric acid, if taken orally, produces symptoms consisting of severe gastroenteritis, nausea, intense headache, progressive stupor, anurea, and vomiting, with vomitus stained
1. black
 2. blue
 3. green
 4. yellow
-
17. Any silver preparation used over a long period may cause discoloration of the skin and mucous membranes known as
1. argema
 2. argyria
 3. melanism
 4. argon
-
18. A symptom *not* associated with copper sulfate poisoning is
1. violent headache
 2. nausea
 3. metallic taste in the mouth
 4. erythematous rash
-

MATCHING ITEMS

To the right of each phrase or symbol in list B write the number of the item most closely related in list A.

19. Match the following drugs with their trade names or synonyms.

A	B	
1. trinitrophenol	D. D. T.	-----
2. cupric sulfate	picric acid	-----
3. chlorophenothane	zephiran chloride	-----
4. benzalkonium chloride	blue vitriol	-----
5. trinitrotoluene		

20. Match the following drugs with their chemical formulae.

A	B	
1. Cu SO_4	silver nitrate	-----
2. Cu_2SO_4	phenol	-----
3. $\text{C}_6\text{H}_5\text{OH}$	copper sulfate	-----
4. Ag NO_3	cresol	-----
5. $\text{CH}_3\text{C}_6\text{H}_4\text{OH}$		

INSTRUCTION TEST

Assignment No. 14

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. The activity of inorganic mercury compounds depends on the release of the "-----" ion, which has an affinity for ----- and precipitates it.
2. If a toxic dose of mercury reaches the ----- there is severe irritation resulting in profuse bloody -----, which may cause ----- and death.
3. Corrosive sublimate is commonly used as a disinfectant for ----- objects.
4. Ammoniated mercury is used in the treatment of ----- skin diseases such as fungus infections and -----.
5. Boric acid is used as an antiseptic irrigation for the -----, nasal passages, mouth and -----.
6. Dimercaptol (BAL) is a very useful chemical antidote in the treatment of ----- poisoning.
7. Symptoms after exposure to formaldehyde gas includes intense irritation to the ----- and ----- tract.
8. Sulfonamides ----- the growth of bacteria and allow the ----- to cope with the infection.
9. Some patients on sulfonamide therapy experience toxic reactions such as -----, nausea and vomiting, headache, dizziness, drug -----, and -----.
10. Sulfaguanidine is used in the ----- and treatment of ----- dysentery.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

11. In proper concentrations formalin is an effective germicide against
 1. gonococci
 2. staphylococci
 3. pneumococci
 4. all forms of organisms
12. the sulfonamides are ineffective in the treatment of
 1. scarlet fever
 2. syphilis
 3. mastoiditis
 4. trachoma

13. For patients requiring surgical operations on the rectum or operation of the intestinal tract, the drug recommended for preoperative and postoperative treatment is
1. sulfathiazole
 2. sulfasuxidine
 3. sulfanilamide
 4. sulfamerazine -----
14. The only sulfonamide currently used in the treatment of chancroid is
1. sulfanilamide
 2. sulfasuxidine
 3. sulfathiazole
 4. sulfadiazine -----
15. When sulfapyridine, sulfadiazine, and sulfamerazine are used in the treatment of various infections, the daily alkaline urine output should be above
1. 250 cc.
 2. 500 cc.
 3. 750 cc.
 4. 1,000 cc. -----
16. Sulfamerazine, in the free state, is more soluble than sulfadiazine and in the acetylated form is less likely to have a toxic reaction in the
1. stomach
 2. bladder
 3. kidney
 4. colon -----
17. The average therapeutic dose of all sulfonamides is
1. 15 grains
 2. 30 grains
 3. 45 grains
 4. 60 grains -----
18. The drug of choice in treatment of gonococci infections is
1. sulfamerazine
 2. sulfapyridine
 3. sulfanilamide
 4. either sulfathiazole or sulfadiazine -----
19. Mercury has an inhibitive action on
1. pneumoccus
 2. treponema pallidum
 3. streptococcal infections
 4. bacillus brevis -----

MATCHING ITEMS

To the right of each phrase or symbol in list B write the number of the one most closely related item in list A.

20. Match the following drugs with their trade names or synonyms.

A	B
1. mercury	formalin
2. succinylsulfathiazole	corrosive sublimate
3. ammoniated mercury	sulfasuxidine
4. mercury bichloride	quicksilver
5. formaldehyde solution	

INSTRUCTION TEST

Assignment No. 15

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. Penicillin is chiefly effective against certain strains of and anaerobic Gram-..... organisms.
2. Penicillin is practically nontoxic; however, some patients have reactions, even after local applications.
3. Bacteria may become resistant to penicillin if subjected to concentrations of the drug.
4. Antibiotics are products of living which kill or the growth of other microorganisms.
5. Tyrothricin is ineffective and when administered orally or parenterally.
6. Crystalline penicillin G is stable at ordinary temperatures, but its solution should be kept
7. Penicillin is effective in the treatment of, in conjunction with the antitoxin.
8. Streptomycin is of toxicity and is effective against both Gram-positive and Gram-negative
9. Aureomycin hydrochloride acts as a in rickettsial diseases.
10. Tyrothricin contains two water soluble principles, and

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the space provided.

11. The potency of penicillin is expressed in terms of the
1. oxford unit
2. international unit
3. continental unit
4. cat unit -----
12. Penicillin is effective in the treatment of one of the following
1. E. coli infections
2. tuberculosis
3. undulant fever
4. syphilis -----
13. Penicillin preparations contain principally penicillin G, but a few have appreciable amounts of penicillin
1. F
2. K
3. X
4. Y -----
14. When penicillin is given orally, a buffer should be added to
1. activate the penicillin
2. minimize the toxic reaction
3. minimize the gastritis
4. minimize gastric acidity -----
15. Tyrothricin is *not* used in the treatment of
1. impetigo
2. chronic abscesses
3. postular dermititis
4. gonococcus -----
16. The oral dose of penicillin potassium on a fasting stomach is
1. 15,000 units
2. 150,000 units
3. 1,500,000 units
4. 15,000,000 units -----
17. Which of the drugs listed below is most suitable in the treatment of Gram-negative infections of the urinary tract?
1. Penicillin
2. Streptomycin
3. Aureomycin
4. Tyrothricin -----

18. Due to its irritating effect on the tissue, tyrothricin is never applied locally in concentrations greater than
 1. 1:1000
 2. 1:2000
 3. 1:3000
 4. 1:4000
19. The antibiotic used for its suppressive effect in the treatment of all forms of tuberculosis is
 1. penicillin G sodium
 2. chloromycetin
 3. aureomycin
 4. streptomycin
20. The antibiotic useful in the treatment of gonorrhea caused by penicillin resistant organisms is
 1. chloramphenicol
 2. aureomycin
 3. dihydrostreptomycin
 4. streptomycin

INSTRUCTION TEST

Assignment No. 16

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. Anthelmintics are divided into _____, which kill or paralyze the worms, and _____, which cause their expulsion.
2. Most anthelmintics are _____ to the host as well as to the worm.
3. Two or three days prior to the administration of an anthelmintic, the patient should be placed on a _____ diet, high in protein and _____.
4. Hexylresorcinol is a powerful vermicide of low _____, effective against hookworm, pinworm, dwarf tapeworm, whipworm, and _____.
5. Arsenicals are used in the treatment of _____ infections.
6. Large doses of arsenic may cause blisters to form in the _____ as the result of escaping plasma, producing a diarrhea with "_____ " stools.
7. Arsenic inhibits the formation of _____ blood cells when they are in excess and is used for this action in the treatment of _____.

8. The outstanding effect of acute antimony poisoning is -----, produced by pronounced -----.
9. Quinine is toxic to bacteria and many ----- organisms, such as trypanosomes, yeast, -----, and spermatozoa.
10. The symptoms of quinine poisoning include ----- in the ears and a sensation of fullness in the head. Large doses may cause ----- in hearing or -----.
11. Antimony is used as a ----- in the treatment of protozoan infections, such as leishmaniasis, schistosomiasis, -----, and trypanosomiasis.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

12. Quinacrine hydrochloride does not overcome the clinical symptoms of malaria as quickly as quinine, but it causes a more rapid disappearance of the
 1. schizont
 2. gametocytes
 3. reticulocytes
 4. trophozoites
13. A yellow discoloration of the skin, sweat, tears, and urine is caused by the continued use of
 1. atabrine
 2. quinine
 3. plasmochin
 4. proguanil
14. Hexylresorcinol pills should not be bitten into because contact of the drug with the mucous membranes causes
 1. headache
 2. gastritis
 3. ulcerations
 4. yellow vision
15. Which of the drugs listed below is classified as a radical cure for vivax malaria?
 1. Pentaquine Phosphate
 2. Chloroguanide Hydrochloride
 3. Pamaquine Naphthoate
 4. Quinine
16. The average dose of Atabrine is
 1. 1 grain
 2. 1½ grains
 3. 2 grains
 4. 2½ grains

17. Emetine has a direct lethal action on
 1. treponema pallidum
 2. bacillus brevis
 3. falciparum malaria
 4. endamoeba histolytica
18. Carbarsone owes its direct amebacidal action to the presence of its
 1. carbon content
 2. emetine content
 3. arsenic content
 4. iodide content
19. Carbarsone is effective against the cyst and motile forms of amoeba, but it acts only on infections in the
 1. intestines
 2. liver
 3. kidney
 4. bile ducts
20. The daily dose of emetine hydrochloride should not exceed
 1. 30 mg. daily
 2. 50 mg. daily
 3. 60 mg. daily
 4. 120 mg. daily

MATCHING ITEMS

To the right of each phrase or symbol in list B write the number of the one most closely related item in list A.

21. Match the following drugs with their trade name or synonym.

A	B
1. chloroguanide hydrochloride	plasmochin
2. diiodohydroxy quinolin	atabrine
3. quinacrine hydrochloride	vioform
4. iodochlorhydroxyquin	diodoquin
5. totaquine	proquanil
6. pamaquine naphthoate	

INSTRUCTION TEST

Assignment No. 17

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. Biologicals are drug products used for _____, treatments, and diagnosis of infectious diseases.
2. A bacterial vaccine is a suspension of killed _____ bacteria in physiological salt solution to which a _____ has been added.
3. An antigen is any substance that can cause the formation and appearance of specific _____ in the circulation of animals.
4. A deficiency of parathyroid secretion will cause a _____ of the blood calcium level and symptoms of _____ deficiency.
5. The conversion of diphtheria toxin into a toxoid has been accomplished by _____ or by treatment with different percentages of _____.
6. Serums are administered both as prophylactic and _____ agents.
7. Normal human serum should not be used if it appears _____ by transmitted light.
8. Biologicals include serums, _____, antitoxins, bacterial vaccines, antigens, _____, and toxoids.
9. Immunity is a condition of the body which _____ it from contracting a _____ disease or which enables it to _____ infection effectively.
10. The active constituent in thyroid is the hormone _____, which is an iodine containing globulin, yielding _____ upon hydrolysis.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

11. Antibodies which cause complete dissolution of the invading organisms are known as
 1. hemolysins
 2. agglutinins
 3. opsonins
 4. antitoxins_____

12. Antibodies which agglutinate or precipitate the invading micro-organisms are known as
1. hemolysins
 2. bacteriotropins
 3. bacteriolysins
 4. precipitins -----
13. The therapeutic dose of tetanus antitoxin is
1. 1,500 units
 2. 2,000 units
 3. 20,000 units
 4. 200,000 units -----
14. Toxins which are contained in the cell bodies and given off after death of the bacteria are called
1. endotoxins
 2. exotoxins
 3. toxoids
 4. antitoxins -----
15. For immunization, one-half cubic centimeter of typhoid vaccine is repeated twice at intervals of
1. 1 to 6 days
 2. 7 to 14 days
 3. 7 to 28 days
 4. 7 to 30 days -----
16. If the cause of the calcium deficiency is prolonged, the blood will compensate by drawing calcium from the
1. cartilage
 2. bone
 3. adrenal gland
 4. liver -----
17. The chemical antidote for soluble barium salts is
1. tartar emetic
 2. sodium bicarbonate
 3. magnesium or sodium sulfate
 4. atropine -----
18. Liver extract produces an almost immediate improvement in the blood condition in most cases of
1. idiopathic anemia
 2. macrocytic anemia
 3. aplastic anemia
 4. pernicious anemia -----

19. One of the following drugs, used as a diagnostic agent in ophthalmology to delineate corneal ulcerations and foreign bodies, is
1. methiodal sodium
 2. Congo red
 3. fluorescein sodium
 4. phenolsulfonphthalein
-

MATCHING ITEMS

To the right of each phrase or symbol in list B write the number of the one most closely related item in list A.

20. Match the following biologicals with their common names or synonyms.

A	B	
1. diagnostic diphtheria toxin	Dick test toxin	-----
2. diphtheria toxoid	typhus vaccine	-----
3. immune serum globulin	measles prophylactic	-----
4. epidemic typhus vaccine	Schick test toxin	-----
5. typhoid vaccine	anatoxin-Ramon	-----
6. scarlet fever streptococcus toxin		

INSTRUCTION TEST

Assignment No. 18

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. The adrenal cortex secretes desoxycorticosterone which is used in the treatment of ----- disease and muscular weakness.
2. Parathyroid injection is used as a specific in the treatment of ----- deficiency caused by a lack of parathyroid secretion.
3. Androgens are used in the treatment of male climacteric, in the treatment of -----, and to suppress -----.
4. Posterior pituitary is used as an -----, as an antidiuretic in the treatment of diabetes insipidus, and as a stimulant to intestinal ----- in abdominal distention following abdominal operations.
5. Thyroid is used in the treatment of juvenile myxoedema, -----, menstrual disorders, -----, and in certain bone and ----- diseases.

6. Estrogens are used in the treatment of _____, gonorrheal vaginitis in children, senile and juvenile vaginitis, and to suppress _____.
7. In high concentrations in the body, estrogenic hormones suppress the activity of the _____ pituitary and _____ production of the gonadotropic hormone.
8. Estrogenic hormones include estronet, estradiol, and _____.
9. Pyroxidine (Vitamin B₆) appears to be associated with certain _____ conditions and with the utilization of _____ acids.
10. A deficiency of choline in the diet of a mammal gives rise to fatty degeneration of the _____ and _____.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided

11. Protamine insulin is usually preferred in the treatment of diabetes because it is
 1. slowly absorbed
 2. rapidly absorbed
 3. easily tolerated
 4. nontoxic
12. Which of the drugs listed below is used because of a deficiency of prothrombin in the blood?
 1. Vitamin C
 2. Vitamin B₁
 3. Vitamin K
 4. Vitamin E
13. Oxidized cellulose is used as a surgical hemostatic agent, acting as
 1. a styptic
 2. an astringent
 3. an artificial clot
 4. an absorbent
14. Heparin sodium is used in the prophylaxis and treatment of
 1. hemophilia
 2. hepatitis
 3. nephritis
 4. thrombosis
15. A solution of fluorescein sodium when applied to corneal ulcerations, stains the ulcerated area
 1. green
 2. red
 3. blue
 4. purple

16. Paraminobenzoic acid is used to increase the blood level of salicylates and
1. antipyrine
 2. aureomycin
 3. barbiturates
 4. streptomycin
-
17. Which of the drugs listed below is believed to be the true anti-pernicious anemia factor?
1. Vitamin B₁₂
 2. Vitamin G
 3. Niacin
 4. Niacinamide
-
18. Which of the drugs listed below is used in pellet form for tissue implantation?
1. Progesterone
 2. Diethylstilbestrol
 3. Testosterone
 4. Methyltestosterone
-
19. Which of the drugs listed below would be used in the treatment and prevention of spontaneous, habitual, or threatened abortion?
1. Ethisterone
 2. Estradiol
 3. Estrone
 4. Stilboestral
-

MATCHING ITEMS

To the right of each phrase or symbol in list B write the number of the one most closely related item in list A.

20. Match the following drugs with their common names or synonyms.

A	B	
1. progesterone	pranone	-----
2. riboflavin	niacin	-----
3. pyroxicline	oreton	-----
4. nicotinic acid	vitamin B ₂	-----
5. testosterone	prolution	-----
propionate		
6. ethisterone		

CHAPTER

4

PREScription WRITING AND FILLING

Read pages 55 through 83 of the Navy Training Course for *Hospital Corpsman 2*, NavPers 10666.

INSTRUCTION TEST

Assignment No. 19

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. In dispensing, it is a good practice to write the before filling the prescription as it affords more time for considering the manner of the doses.
2. A pharmacist has no authority to change a prescription without permission from the officer.
3. If a pharmacist observes any ambiguity, incompatibility, or dangerous, and thus finds it necessary to consult a medical officer, the should never be allowed to suspect that anything is wrong.
4. When a narcotic prescription can only be partially filled, a notation should be made on the of the prescription stating the reason for not furnishing the full amount.
5. Prescriptions are usually written in, but some may be in Latin, or in English with some Latin terms.
6. When compounding a prescription, the solid ingredients should first be dissolved in the in which they are most soluble before adding other
7. An extemporaneous prescription calling for narcotic drugs not in excess of the amount may be
8. Prescriptions by exempt officials for narcotics must be written on official prescription blanks or official
9. If the pharmacist dispenses a preparation in which a color change will take place, he should that fact to the so his suspicions will not be aroused when he notices the change.

10. Narcotic preparations dispensed for aural, _____, ocular, rectal, or _____ purposes are not regarded as being for _____ use.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

11. When the letters s. v. r. appear in the body of the prescription, which of the substances listed below would be used?
1. Alcohol
2. Brandy
3. Wine
4. Methyl alcohol _____
12. If the contractions "M. ft collut." appeared on a prescription, you would prepare
1. an eyewash
2. a nosewash
3. a mouthwash
4. an earwash _____
13. All narcotic prescription numbers are preceded by the letter
1. M
2. N
3. W
4. P _____
14. All solutions of bichloride of mercury shall be tinted
1. blue
2. pink
3. red
4. orange _____
15. When compounding a prescription, the first thought should be
1. weighing
2. trituration
3. dosage
4. the order of mixing _____
16. Prescriptions for alcohol should be kept in
1. a separate file
2. the narcotic file
3. the regular file
4. the whiskey file _____
17. Regulations require that a medical officer sign a prescription with his name and
1. department
2. file number
3. rank
4. address _____

18. In compounding prescriptions, one of the methods frequently employed in preventing physical incompatibilities is by
1. suspension or emulsification
 2. straining
 3. filtering
 4. elutriation
-
19. Many organic substances, such as alkaloids, are in the form of salts and are therefore soluble in
1. alcohol
 2. acetates
 3. water
 4. acetone
-

MATCHING ITEMS

To the right of each phrase or symbol in list B write the number of the one most closely related item in list A.

20. Match the following contractions with the appropriate English meaning.

A	B	
1. cap	to please	-----
2. dieb. alt	waxed paper	-----
3. collyr	let it be labeled	-----
4. placebo	an eye wash	-----
5. chart. cerat	a nose wash	-----
6. caps	let the patient take	-----
7. collun		
8. sig		

INSTRUCTION TEST

Assignment No. 20

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. What appears to be an overdose on a prescription may be a ----- dose for a certain patient, but the medical officer will appreciate being called to ----- the dose.
2. After the prescription is labeled, the ingredients should be checked by some ----- method.
3. The date of compounding should always appear on the -----.
4. The furnishing of narcotics pursuant to telephone orders or verbal advice of the medical officer is -----.

5. Medical officers are exempt from and payment of the tax.
6. Alcohol prescriptions should be numbered in and preceded by the letter
7. Precipitation may occur when two liquids are mixed, or it may take some time for the to form.
8. Navy prescriptions for narcotics may be filled by a pharmacist when they cannot be furnished from stocks.
9. Alcoholic solutions precipitate from mucilages but dilution of the mucilage or alcoholic solutions with will prevent precipitation.
10. Before dispensing gaseous solutions, some means of hastening the, such as shaking or heating, should be used, as may develop within the bottle to a sufficient degree to break it or to cause on opening.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

11. An amendment to the Federal Narcotic Act provides for the discontinuance of manufacture and sale of
 1. viratrum viride
 2. heroin
 3. marijuana
 4. belladonna
12. When a solution containing a small proportion of resin is mixed slowly with a water solution, the result is a fine, milky
 1. suspension
 2. emulsion
 3. lotion
 4. magma
13. If preparations containing exempt narcotics are in solid or semi-solid form, the amounts pertain to the
 1. troy ounce
 2. apothecary pound
 3. avoirdupois ounce
 4. apothecary ounce
14. A preparation containing codeine could be dispensed as an exempt narcotic if it contains less than
 1. 1 grain in 5 cc.
 2. 1 grain in 10 cc.
 3. 1 grain in 15 cc.
 4. 1 grain in 30 cc.

15. A separate file is kept for whiskey, brandy, or wine in numerical sequence with the number preceded by the letter
1. A
 2. B
 3. W
 4. X
-
16. Acacia mucilage is gelatinized by a solution and tincture of ferric chloride, as an example. The gelatinization may be prevented by diluting the mucilage with
1. one volume of water
 2. small amounts of glycerin or syrup
 3. sodium borate solution
 4. solution of ferric sulfate
-
17. Which of the drugs listed below is regarded as dangerous and should not be dispensed without prescription?
1. Benzedrine inhalant
 2. Cevitamic acid
 3. Sulfonamides
 4. Neosynephrine $\frac{1}{2}$ of 1%
-
18. Epinephrine solutions should be dispensed with a prescription if the percentage strength is one of the following strengths or stronger.
1. $\frac{1}{4}\%$
 2. $\frac{1}{2}\%$
 3. $\frac{3}{4}\%$
 4. 1%
-

MATCHING ITEMS

To the right of each phrase or symbol in list B write the number of the one most closely related item in list A.

19. Match the following Latin contractions with their English meanings.

A	B	
1. guttat	at bedtime	-----
2. hor som	a pint	-----
3. m	food	-----
4. pab	mix	-----
5. gtt	drop by drop	-----
6. o		

20. Match the following Latin contractions with their English meanings.

A		B	
1. agit ben		take (thou)	-----
2. Rx		every two hours	-----
3. m		shake well	-----
4. cyath		a small paper	-----
5. omn. sec h.		morning	-----
6. chart			

VENTILATION, HEATING, LIGHTING, AND BERTHING AS APPLICABLE TO HEALTH STANDARDS

SANITARY STANDARDS FOR LIVING SPACES

Barracks

1. The medical officer shall make routine inspections of barracks in order to maintain Navy standards of sanitation.

2. The following are minimum requirements per man in all dormitories or sleeping rooms:

50 square feet of floor space per man.

450 cubic feet of room space per man.

5 feet minimum distance between heads of sleeping men.

3. For units of approximately 200 men, the minimum proportions of plumbing fixtures to the number of men to be accommodated are as follows:

Water closets 1 for every 20 men.

Urinals 1 fixture for every 25 men or one
foot of trough for every 10 men.

Lavatories 1 basin or 2 feet of trough lavatory
or wash sink for every 5 men.

Dental lavatories . . . 1 for every 15 men.

Showers 1 for every 25 men.

Scrub decks 4 linear feet for every 20 men.

4. These proportions may be decreased for larger units of men, but must be increased for small units; for example, the requirements for a detention barracks of 12 men are:

Water closets	2
Lavatories	2
Urinals (4 foot trough)	1
Showers	3

5. Toilet, washing, and bathing facilities must be increased over the proportion given for 200 men, in schools where men use all these facilities at one time. The required capacity for hot water storage tanks may be roughly determined from the following allowances:

	Gallons
1 lavatory	5
1 sink	10
1 shower	20

6. Scrub decks for clothing, when located in the latrine buildings, shall be in an entirely separate compartment with separate entrance. The general weather conditions prevailing at a station will determine the necessity for a separate room where the clothes are dried, or for outdoor washing places and drying rigs. For additional or more detailed information concerning the requirements for installation practices of the accessories described above, reference shall be made to Design Data, Bureau of Yards and Docks.

Berthing Spaces and Sanitary Facilities Afloat

1. The medical officer shall make routine sanitary inspections of berthing spaces, and toilet, lavatory, and bathing facilities. He shall exercise due judgment in the interpretation of applicable standards, giving careful consideration to functional design of the ship, its military requirements, the resistance to contagion of seasoned men, and the advantages deriving from a high standard of individual hygiene. Desirable minimal standards are not attainable at all times due to the necessary consideration for changes in weight and movement of the ship.

2. A berthing compartment shall have at least 16 square feet of floor space, 120 cubic feet of air space per man, and 3 feet minimal distance between the heads of sleeping men, using head to foot bunking arrangement. These dimensions

will be less than acceptable unless ventilation is adequate (10 to 30 cubic feet of fresh air per person per minute). When ventilation is not adequate, the medical officer shall make appropriate recommendations with regard to it.

3. Water closets, urinals, lavatories, and showers shall approximate requirements ashore insofar as practicable. The following standards are at present the policy of the Bureau of Ships:

Water closets.....	1 for 18 crew or 25 troops.
Urinals.....	1 fixture or 20 inches of trough for 40 crew or 50 troops.
Lavatories.....	1 basin or 2 feet of trough for 15 men.
Showers.....	1 fixture for 60 crew or 75 troops.
Dental lavatories..	Not provided.

HEATING, VENTILATION, AND AIR CONDITIONING OF SHIPS

1. *General.*—Matters of material relating to heating, ventilation and air conditioning on shipboard come under the cognizance of the Air Conditioning Section of the Shipbuilding Division of the Bureau of Ships. But since these matters bear such an important relation to the well-being of all personnel afloat, it is important that members of the Navy Medical Department be familiar with the fundamentals of heating and ventilation so that they may interpret the results properly. The medical officer afloat must be able to define and recognize satisfactory air conditions, and, equally as important, must be able to define and recognize air conditions which will be prejudicial to the health of personnel. This means that the medical officer and members of his department must make basic air measurements in terms of temperature, humidity and air movement, and must record physiologic data in terms of pulse rate, body temperature and certain clearly defined subjective reactions. He must then evaluate this data and submit his findings to the engineer together with any specific recommendations he may have.

2. *Purpose*.—It is the purpose of this chapter to present the fundamentals of heating, ventilating and air conditioning, and to describe the physical and physiologic measurements which can be made on shipboard in order to evaluate the existing atmosphere in terms of its reaction on personnel.

3. The components by which any atmosphere can be fully described, dry bulb and wet bulb temperatures, wall surface temperature, moisture content or relative humidity, and air movement, are familiar to personnel of the Navy Medical Department. They are presented briefly here as reference material, for this chapter will deal largely with these properties.

4. *Dry Bulb Temperature*.—The dry bulb temperature of air is that temperature recorded by any ordinary thermometer the reservoir or bulb of which is dry and, therefore, not affected by the cooling effect of evaporation of moisture. When the layman speaks of the prevailing air temperature, which he reads from his standard mercury thermometer, he is speaking of the dry bulb temperature.

5. *Moisture Content*.—The atmosphere always contains a certain amount of moisture in the vapor state. The (dry bulb) temperature of the existing air directly affects the capacity of the air for containing evaporated moisture. Moisture content is usually expressed in terms of grains of moisture per pound of dry air.

6. *Relative Humidity*.—Relative humidity is the ratio of the amount of water vapor the air *does* contain under existing conditions to the amount of water vapor the air *could* contain at the same dry bulb temperature when saturated.

7. *Wet Bulb Temperature*.

(a) The wet bulb temperature, measured by a standard wet bulb thermometer, is that temperature which a thoroughly wet body will attain if the air passes over it for a sufficient length of time and with a high enough wind velocity. When wet and dry bulb temperature are the same, the air is said to be *saturated* (or relative humidity is 100%). If the dry bulb temperature is lowered below this saturation point, moisture condenses; in other words, it rains.

(b) In practice a *sling psychrometer*, mounting a wet

and dry bulb thermometer side by side, is used to determine these two temperatures. The relative humidity can then be determined directly from the *psychrometric chart*.

8. *Air Movement*.—Air movement, applied to heating and ventilating of rooms, refers to turbulent air currents at any given point in a room. It is usually expressed in feet per minute (f. p. m.).

9. Effective temperature is a consideration of basic importance to the subject of naval ventilation. Its applications as well as its limitations should be thoroughly understood.

10. *Significance of Effective Temperature*.

(a) Effective temperature is an index which combines into a single value the thermal effect of temperature, humidity and movement of air upon the human body. By repeated experiments, the subjective response by groups of individuals to variations of temperature and humidity in still and moving air was studied. A series of different temperatures and humidities which produced the same feeling of warmth or coldness were taken as having the same effective temperature. Effective temperature lines may be included on the psychrometric chart.

(b) Effective temperature is an index, or series of humidity-temperature conditions, rather than a quantitative measurement. In order to identify a given effective temperature series, the corresponding saturation temperature is used. Thus an effective temperature of 80 degrees (written 80° E. T.) is that series of humidity and temperature conditions all of which impart the same feeling of warmth to the body as does air at 80 degrees F. and 100% relative humidity. Increasing the movement of air reduces effective temperature. For example, 75 degrees E. T. in still air corresponds with 71.5 degrees E. T. in air moving at a rate of 300 f. p. m.

(c) The foregoing facts would lead to the conclusion that conditions of comfort may be realized by varying one or two of the effective temperature components independently of the others, or by varying all together. Within practical limitations this is true, but these limitations must be given full recognition.

11. *Limitations of Effective Temperature Charts.*

(a) Effective temperature charts, can be applied only under conditions duplicating those under which the data for the charts were assembled. Air velocities must be approximately the same. Weight of clothing and degree of activity must be about as specified. Most important, since these charts deliberately omit radiant heat as a factor, a correction must be applied. Under ordinary air conditions, each degree of elevation or depression in the mean "wall" surface temperature (weighted mean temperature of bulkheads, glass, overheads, and decks) above or below the air temperature requires about 0.5 degrees counterchange in the effective temperature.

(b) Although there are no effective temperature charts available for conditions in which radiant heat is a factor, it should be borne in mind that the principle of effective temperature remains valid under these conditions when proper correction for radiant heat is made.

12. *Objectives of Heating, Ventilating and Air Conditioning Afloat.*—In the section of the *Bureau of Ships Manual* devoted to this subject the following objectives are described:

The weight added, the space occupied, and the power consumed by the ventilation, heating and cooling arrangements on a naval vessel must be at the expense of other military necessities.

The minimum of equipment is provided which will accomplish the following purposes:

(a) To maintain, in the living spaces and normally occupied parts of the vessel, conditions which will keep personnel fit to fight under the strain of frequent watches during prolonged wartime cruising.

(b) To maintain at battle stations and in working spaces, conditions which will keep personnel physically fit to fight and mentally keen under the circumstances when such spaces must be occupied during war.

(c) To maintain in certain spaces containing equipment or material the conditions necessitated by the presence of that equipment or material.

Basically the environment must be such that the body

can maintain a proper heat balance and the chemical composition of the air must be such that it contains no harmful components and provides a sufficient quantity of oxygen.

13. *Elements of the Problem.*—In order to evaluate the degree of success achieved aboard ship in meeting the basic physiologic requirements summarized in the final paragraph of these objectives, it is desirable that members of the Navy Medical Department be familiar with certain considerations entering into the design of the heating, ventilating and cooling arrangements on naval vessels.

(a) When designing a heating or ventilating system ashore the climatic conditions of the locale can be anticipated and the system designed accordingly. This obviously is not the case for naval vessels for which the heating and ventilating systems must be designed to provide for climatic conditions ranging from the Arctic in winter to the Tropics in summer. A wide range of flexibility is, therefore, required of the heating and ventilating arrangements aboard ship.

(b) Space, weight and power requirements are important governing factors in the design and specification of ventilation and heating equipment. It is also essential to preserve the structural integrity of the ship, and penetrations of the main watertight structure must be kept at an absolute minimum. In spite of this, fresh air or heat must be provided to various compartments often far removed from the source of supply.

(c) The design is further complicated by the lack of uniformity of ventilation or heat demands throughout the ship. Spaces exposed on one or more sides to the weather are subject to the influences of the existing weather conditions, which may cause high rates of heat gain or loss. Inside spaces may be subject to the effects of so called "wild heat" that is, uncontrolled or waste heat from machinery, boilers, galley stoves, etc. Thus it may be that two compartments separated perhaps only by a passageway, one may require heating and at the same time the other may require cooling. Naval heating and ventilating, therefore, presents the complex problem of providing a minimum of equipment to take care of a maximum range of conditions.

14. *Heating.*—Heating aboard ship is accomplished by drawing fresh outside air over steam coils and discharging the heated air into the various compartments. Outside air is preheated (i. e.: before passing through the fan) to 40 degrees to 60 degrees F. in order to provide greater over-all flexibility of the heating system, and in order to avoid condensation of moisture on the air ducts. The air is reheated to the desired delivery temperature for a given zone prior to distribution to the various compartments and spaces within that zone. Each zone is comprised of a group of adjacent spaces all of which have approximately the same heat demands.

15. *Ventilating.*

(a) Ventilation aboard ship during hot weather serves a dual purpose—cooling and replenishment of vitiated air.

(b) Cooling by ventilation is a process of diluting inside air with outside air. It is evident, therefore, that it is not possible to cool a space by dilution to a temperature lower than that of the outside air. And since there are sources of heat within the ship—personnel, lights, and machinery—it follows that within the practical limitations of ventilation by dilution it is not possible to cool the space as low as the temperature of the outside air. It is analogous to running both hot and cold water simultaneously into a bucket. The temperature of the mixture can never reach that of the cold water itself. BuShips working standard for living spaces is sufficient air to maintain the dry bulb temperature not more than 7 degrees higher than the weather air, but at least 30 cubic feet per minute per man.

(c) Various sources of moisture exist within the ship. Personnel are a constant source of added moisture—a man at light work gives off 1,500 grains of moisture per hour when the temperature is 85 degrees D. B. for example. In addition, there are various machines and operations which add moisture to the atmosphere. Consequently the moisture content of air in living and working spaces will never be less than that of outside air.

(d) Mechanical supply and exhaust are provided for most working and living spaces and the quantity of each is

balanced within the respective major sections of the ship. Those compartments such as galley, laundry, heads, etc., which produce heat or undesirable odors are provided with a greater volume of mechanical exhaust than supply, designed to maintain an induced air flow to the compartment and thus prevent the spread of heat or odors to adjacent spaces. Compartments used for living, berthing, etc., are provided with a greater volume of mechanical supply than exhaust, designed to maintain an induced air flow out of the space and thus prevent the entrance of possibly contaminated air from adjacent spaces.

(e) The fireroom and machinery space require a special application of cooling with outside air. The machinery of these spaces produces so much "wild heat" that it would be literally impossible to reduce the temperature of the entire space to that of good working atmosphere. This being the case, spot cooling is provided personnel on duty. By this method, air is supplied at high velocity from ventilation ducts concentrating their discharge at the respective watchstanders' stations. Although the ambient air temperature may be very high, the space in the immediate vicinity of the watchstander in this manner will be maintained within the range of acceptability.

(f) The need for maintaining the ventilation system clean cannot be overemphasized. It has been estimated that a large naval vessel may take into the ventilation system as much as five tons of dirt in a day. Although most of this is fine, particulate matter, and, therefore, is carried through, a part of this dirt remains in the screens, heaters, fans, cooling coils, and ducts. As this material accumulates in the system, the capacity of the system for delivering air is reduced, ultimately seriously so. For this reason, cleaning schedule for all parts of the ventilation system, particularly for screens, heaters, and cooling coils, should be established for all ships.

16. *Air Conditioning.*

(a) Air conditioning as applied ashore is a broad term, covering the field of heating and ventilating in all its phases.

In this literature the term "air conditioning" is intended to mean temperature and humidity control of air.

(b) Mechanical cooling and dehumidification of air aboard naval vessels is accomplished by passing air through coils containing a suitable cooling agent, or refrigerant. The cooling coils may be located in an intake air duct with the refrigerating machinery located some distance away; or the refrigeration machinery, cooling coils, and circulating fan may be assembled into a single unit. Air, in passing through the cooling coils, gives up heat (to the refrigerant) and moisture (by condensation) and is delivered to the compartment suitably conditioned.

(c) Air conditioning aboard naval vessels has many applications not directly concerned with personnel. Certain work shops, laboratory spaces, and compartments containing precision instruments may require temperature or humidity control, or both.

(d) Except for selected living spaces of newer vessels, air conditioning within the meaning of this chapter has not yet come into general use for living spaces aboard naval vessels. Hospital ships are an exception, for on such ships space and weight factors are less critical and personal comfort of patients and crew assumes greater importance.

17. Effects of Air Movement.

(a) A certain amount of air movement is desirable. In still air the body is enveloped by a layer of warm, moist air, resulting from body heat and evaporation of perspiration. A controlled air movement removes this layer and adds greatly to the feeling of comfort.

(b) The maximum air velocity which can be tolerated comfortably by the human body in warm atmospheres has been established by test to be about 100 to 125 f. p. m. In cool weather good practice generally limits maximum air movement to not over 50 f. p. m. Air blowing at high velocities from the overhead onto the heads of occupants is undesirable except in hot atmospheres. Similarly, an air stream directed against the back and neck becomes uncomfortable.

(c) Bracket Fans:—In hot weather, bracket fans should

be used to provide high local circulation. Bracket fans should be installed in all living and hospital spaces, offices, commissary spaces, and issue rooms. In bunkrooms and crew's berthing spaces, one fan is provided for each 150 square feet of deck area. In cabins, wardrooms, mess-rooms, and crew's reception rooms, one fan only is provided when the deck area is less than 300 square feet; when the deck area exceeds 300 square feet, an additional fan is provided for each 300 square feet of deck area. The officer in charge of ventilation should ascertain that the proper allowance of bracket fans is aboard ship and in operation. No unnecessary electrical equipment such as excess lights should be used. Marked improvement in temperature conditions can be effected in compartments directly under the weather decks by wetting the decks. Frequent applications of a fine spray of water is more effective than a heavy wetting down less frequently.

18. *Effects of Heat.*

(a) As an introduction to this subject it would be desirable to restate for emphasis two practical limitations of hot weather cooling by ventilation aboard ship.

(1) There are sources of added heat within the ship. Therefore, it is not possible to bring the temperature of the air inside the ship to a temperature as low as that of the weather.

(2) There are sources of added moisture within the ship. Therefore, the moisture content of the inside air will always be higher than that of the outside air.

(b) In view of these limiting factors, ventilation rates for hot weather cooling of a given space are always designed to limit the temperature rise of that space to a predetermined amount, using the highest anticipated hot weather (outside) temperature as a base. This highest hot weather temperature is taken as 88 degrees F. D. B. (Fahrenheit Dry Bulb), and for berthing spaces, for example, the maximum temperature rise upon which ventilation rates are based is from 7 degrees F. to 10 degrees F. No reference is made to relative humidity in these calculations since no control over it is possible by ventilation alone.

(c) The physiologic aspects of naval ventilation can be evaluated more readily if the foregoing basic limitations are kept in mind.

(d) The body eliminates waste heat by three means:

(1) By radiation to cooler objects.

(2) By convection—that is, by losing heat to the air as it comes in contact with the body.

(3) By evaporation of perspiration from the surface of the skin and by moisture lost in exhaled air.

(e) The existing atmosphere obviously has a great influence on the manner in which these various heat regulating processes function at any given time. Discounting the effect of radiation, which is an environmental, not atmospheric, consideration and which is therefore wholly unpredictable, the following three examples will serve to illustrate the influence of the atmosphere.

(f) If the dry bulb temperature of the air is 80 degrees F., relative humidity 30%, and air movement moderate, all heat eliminating mechanisms are able to function and the suitably dressed individual feels comfortable.

(g) If the air temperature is raised to 99 degrees F. D. B., and the relative humidity is 30%, and moderate to high air movement exists, no body heat is lost by convection, but an adequate amount of cooling will take place by evaporation of perspiration, and through exhaled moisture. If the air is still or moving slowly, evaporation of perspiration will be so reduced as to result in serious distress from the heat.

(h) If, however, the air temperature is 99 degrees F. D. B. and the air is saturated (100% relative humidity), since the air can take up no additional moisture, and air and body temperature are equal, all means of heat elimination are denied the individual, and the body heat regulating mechanism ultimately will fail.

(i) When the body heat regulating mechanism fails, part of the heat is retained in the body, causing a rise in skin and deep tissue temperature, an increase in heart rate, and accelerated respiration. The metabolic rate also increases owing to the excessive rise in body temperature,

and in extreme conditions a vicious cycle may result which eventually leads to serious physiologic damage.

19. *Acute Overheating.*

(a) Acute overheating leads to four syndromes: *heat stroke, heat exhaustion, super-dehydration, and heat cramps.*

(b) The exact mechanism underlying the production of heat stroke is not well understood. Patients in a hypertherm chamber develop artificial fever, but with free perspiration and without the other evidences of heat stroke. In typical heat stroke, on the other hand, cessation of perspiration seems to be one of the very early signs of trouble. It seems possible to segregate individuals into two classes—those susceptible to heat stroke and those not susceptible to heat stroke. There is some evidence indicating that individuals not susceptible to heat stroke will continue to perspire freely to the end, whereas individuals susceptible to heat stroke exhibit an impaired ability to sweat.

(c) Heat exhaustion or circulatory insufficiency, while still a direct result of difficulty in dissipation of body heat, differs sharply from heat stroke. In the latter condition there is fever and delirium, with full bounding pulse and elevated blood pressure, while the skin is flushed and dry. Immediately important in therapy is rapid heat removal by the best means at hand. Heat exhaustion, on the other hand, is characterized by subnormal body temperature, cold, pale, clammy skin, low blood pressure and a state of circulatory shock. Here immediate treatment should be directed toward raising the body temperature to normal, improving the tone of the vascular system and allaying hyperactivity in the digestive musculature. Administration of salt solution by mouth or vein is indicated.

(d) Of great importance is the physiologic consideration of the shift in blood from the internal organs to the periphery. The dilation of the blood vessels of the skin and the abnormal distribution of blood to the skin area, merely for the purpose of cooling the body, place a heavy load on the cardiovascular system. This shift in blood, moreover, may explain the prevalence of gastrointestinal disorders in hot weather.

(e) A practical precept is that individuals in hot environments must be allowed to sit down periodically to relieve the excessive cardiovascular strain. Otherwise, the common complaint and the factor that limits endurance is tired, swollen feet.

(f) Knowledge is lacking as to why one individual develops the dynamic hyperpyrexia response and another the hypothermic shock reaction. Unfortunately, one experience with either type of excessive heat reaction predisposes the patient to subsequent attacks and to troublesome prodromal symptoms with exposure to external heat of relatively low order. So far no means have been discovered for overcoming this increased sensitivity induced by a preceding heat attack. Careful avoidance of exposure for the next several years remains the only safe course for the patient to follow. Selection of personnel and gradual adaptation to heat will help to reduce the incidence of heat stroke.

(g) Super-dehydration is an excessive loss of water as sweat without adequate replacement. The essential phenomena are thirst, reduced salivation, oliguria (elevated blood pH), acidaemia, dyspnoea, exhaustion, normal temperature, concentration of blood, shriveled skin and sunken eyes.

(h) Heat cramps, in the skeletal muscles, bear little relation either to heat stroke or heat exhaustion. The cramps are due primarily to excessive salt loss during profuse and prolonged perspiration without adequate salt intake. Relief is readily obtained by adding ordinary table salt to the drinking water, or taking it in any other convenient form. Sometimes a patient suffering from heat exhaustion will also be suffering from skeletal muscle cramps, but usually the conditions are not associated. Laborers in desert heat and in boiler or furnace rooms are particularly prone to heat cramps because of their excessive perspiration and rapid salt loss.

20. *Salt, Salt Solutions, Fluids, and Vitamin C Requirements.*

(a) Salt loss through the skin as a result of sweating is of the order of 0.1 to 0.5 percent depending upon acclimatiza-

tion. During a period of twenty-four hours, four to eight quarts of fluid and four to eight grams of salt, equivalent to one or two teaspoons of salt may be lost in this manner.

(b) Replenishment of this quantity of salt is best obtained, not through the ingestion of salt tablets, but by greater ingestion of salt at mealtime or by *adding salt to the drinking water to make a solution of not more than 0.10 percent salt*. The salinity of this solution for cold water is not objectionable.

(c) If small quantities of salt are not added to the drinking water, the serving of soup or tomato juice will take care of the problem, which is essentially the replacement of salt lost through the skin.

(d) A bouillon cube containing two grams of salt, dissolved in a pint of water, twice daily will usually meet the additional salt requirements.

(e) Studies indicating that vitamin C may also be excreted in sweat have been reported, and the addition of vitamin C to the diet accordingly may be desirable. Mills has further stated that additional vitamin B, thiamin hydrochloride, is beneficial in hot atmosphere.

21. *Control of heat.*

(a) Naval ventilation is designed to prevent not only the existence of conditions aboard ship which could lead to acute overheating, but is designed to maintain an atmosphere conducive to physical efficiency of personnel.

(b) The upper limit of desired air conditions is based upon shipboard tests. The effective temperature range of 69 degrees E. T. to 75 degrees E. T. will be associated with heat loss from the body without visible sweating. In men at rest, about 60 to 80 percent of body heat loss will be brought about by radiation and convection, and 20 to 40 percent by the evaporation of insensible perspiration. If the ventilation system succeeds in eliminating visible sweating of personnel at rest, it is fulfilling one of the most important purposes for which it was designed. Moisture lost from the body by sweat which runs off as liquid does not represent a heat loss, for it is the latent heat of evaporation which brings the cooling effect to the body surface.

(c) While the range of 69 degrees E. T. to 75 degrees E. T. represents the upper limits of air conditions desired for comfort, it is apparent from an understanding of the practical limitations of ventilation that the desired effective temperature cannot always be maintained. As a practical measure, therefore, an understanding should be gained of what air environment can be tolerated. In arriving at the upper limit of tolerance, it must be recognized that the dividing line between atmospheric conditions which can be tolerated and those which cannot be tolerated is not clear-cut. Kind and amount of clothing will influence the selection. Bracket fans will increase air movement. Men acquire a degree of acclimatization to tropic weather. These factors tend to raise the maximum effective temperature which can be tolerated.

(d) The following observations may be taken as an average:

(1) An effective temperature of about 86 degrees F. is the upper limit at which heat balance can be maintained at rest without a rise in body temperature.

(2) An effective temperature of 91 degrees F. is an upper limit in compartments deprived of spot cooling for men exposed during a four-hour watch. A rise in body temperature and an increase in pulse rate will occur, even during the resting state.

(3) As a result of long experience in mining operations in South Africa, it is considered that 93 degrees F. in air saturated with moisture, hence 93 degrees F. effective temperature, is a critical level above which many cases of heat prostration occur.

22. *Effects of Cold.*

(a) The initial responses to cold are indicative of stimulation of the sympathetic nervous system to produce shivering and finally a secretion of adrenin which gives rise to constriction of blood vessels, increased heart rate and blood pressure, hyperglycemia, and increase in metabolism. There is also evidence that the thyroid gland enlarges in response to stimulation by cold. These reactions tend to be beneficial to healthy individuals but harmful to the unfit.

(b) The harmful effects of chilling are manifest in individuals hypersensitive to cold, and in persons susceptible to respiratory infections. Some individuals, for example, exposed to cold water or air may exhibit urticaria and syncope, symptoms indicative of the liberation of abnormal amounts of histamine in the skin.

(c) There is good evidence showing that exposure to cold and to changes in temperature lower the resistance of animals to infection, apparently by depressing their defensive mechanism. The prevalence of respiratory diseases in cold weather is attributed partly to the lowered resistance of the mucous membranes of the nose and throat, which results from the vasomotor shifts of blood in the internal organs. Keyser believes that the lowered resistance is due to a diminution in the number and phagocytic activity of the leucocytes (white blood cells) brought about by exposure to cold and changes in temperature.

(d) On exposure to cold, the loss of heat is increased considerably, and only within certain limits is compensation possible by increased heat production and diversion of blood to the internal organs. The blood pressure rises owing to constriction of the peripheral vessels and to concentration of the blood. The skin, subcutaneous tissues, and muscles form reservoirs for storing the water which leaves the blood. In extremely cold atmospheres, the protective responses fail, and death may follow when the body temperature (rectal) falls to about 80 degrees F., although in hypothermia, Talbott reports rectal temperatures of 72 degrees F., with complete recovery, and others have reported similar values in severe alcoholism.

(e) The effects of cold are first exhibited by a painful vasoconstriction and cyanosis followed by a reactive hyperemia, normal color, and cessation of pain.

(f) The feet, representing a dependent part of the body possessing the poorest circulation, usually show the complications of exposure to extreme cold, or to a more moderate degree of cold if prolonged and "wet," which give rise to such terms as "trench foot" and "immersion foot."

(g) In the case of chilling without actual frostbite, i. e.

killing of tissues, the parts involved often become edematous on being warmed up. There can be no doubt that the easiest way to reduce the edema of chilling consists in alternating cold and heat quite rapidly. Therefore, heat should not be applied to an area of the body affected by cold.

(h) From the practical viewpoint of naval ventilation, less emphasis need be placed upon the effects of prolonged exposure to sub-freezing temperatures than upon the physiologic effects upon men who are repeatedly subjected to a sudden and extreme change of temperature as they come from heated compartments to sub-freezing topside weather. The injury is increased if the compartment contains a dry, hot atmosphere, which is conducive to injury of the membranous nasopharynx, especially upon subsequent exposure to cold air.

(i) Catarrhal fever, acute and chronic tonsillitis, and influenza grouped together comprise thirty percent of all admissions, and 11.5 percent of total sick days. Apart from overcrowding, the effect of rapid changes in environmental temperatures is a paramount predisposing cause in this type of infection.

23. *Heating of Cold Air.*

(a) The Bureau of Ships, recognizing the problem, endeavors to make some compensation for it in their designs for cold weather heating. In their *Instructions for Heating of Spaces on Naval Vessels* the Bureau of Ships Tentative Ventilation Standards state:

An appreciable physiological strain is caused by going from an overheated compartment to below freezing topside temperatures. During cold weather it is much better to maintain living space temperatures at the minimum consistent with comfort.

(b) During cold weather, therefore, living spaces aboard ships are designed to be maintained 70 degrees F. D. B. Inside working spaces are heated to a lower temperature which will be in keeping with the degree of physical exertion the work demands. Keeping in mind that these temperatures are designed to be the "minimum consistent with comfort," it will be to the best interests of all if individual

demands for adjustment in temperature be met by adding or removing outer clothing.

(c) It has been described previously in this chapter that for all normal applications heating of compartments in cold weather is accomplished by heating the air delivered (at a reduced rate) by the ventilation system. The amount of heat supplied is designed to balance heat lost when the outside weather temperature is 10 degrees F. and sea temperature, 35 degrees F.—the lowest anticipated temperatures for air and sea respectively.

(d) It will be seen from the psychrometric chart that the moisture content of cold air is very low. Saturated air at 10 degrees F. contains only 9 grains of moisture per lb. of dry air, whereas, the corresponding value for saturated air at 80 degrees F. is 155 grains. This characteristic presents a contrast between summer and winter ventilation which bears consideration. The relative humidity of incoming air during summer ventilation is the same as that of the weather. The relative humidity of incoming air during winter ventilation on the other hand is considerably lower, after heating, than the weather air. For example, if the temperature of weather air at 10 degrees F. D. B. and 70% relative humidity is raised to 70 degrees F. D. B. without any moisture being added or removed, the relative humidity will be 5% upon delivery to the compartment.

24. *Oxygen deficiency in closed spaces.*

(a) In spite of the continual emphasis which has been placed upon the existence of this hazard, fatal accidents are still occurring afloat, either from failure to recognize this danger or to take adequate precautions against it.

(b) Notice the suddenness with which the following multiple tragedy occurred on a battleship at sea early in 1944:

Three deaths resulted from entering a space on the sixth deck below, which had not been previously ventilated. The air in this space was known to be foul and the first man to enter did so to install a blower for ventilation purposes. Before he could get the blower into operation he succumbed to the lack of oxygen and what was later

determined to be a very high percentage of carbon dioxide (between 7 and 8 percent). The other two were overcome attempting to aid the first. The men were removed by workers using rescue-breathing apparatus but not before they had been unconscious for from ten to fifteen minutes. Artificial respiration and all other resuscitatory measures were without avail.

(From the report of the senior medical officer)

(c) The report reveals that in this case a deficiency of oxygen was suspected, and precautions were being taken to remedy the deficiency. Unfortunately the precautions were inadequate.

(d) All void spaces, storage tanks, all closed store-rooms (particularly those containing fresh fruit or vegetables), and storerooms in which the ventilation has been shut down for a day or more, should always be considered as potentially deficient in oxygen.

(e) Whenever oxygen lack is suspected, the following precautions must always be observed.

(1) Provide ladders in holds or compartments that must be entered from the deck above.

(2) Provide thorough ventilation before entering the compartment.

(3) Provide a life line for all persons entering the compartment.

(4) Whenever personnel enter any compartment where there is known or suspected to be a noxious gas (or lack of oxygen) they must wear a self-contained oxygen breathing apparatus. Do not substitute a different type respirator.

(f) Of frequent occurrence is the fatal error of entering closed compartments without taking the third and fourth simple precautionary measures.

25. *Carbon Dioxide*.—Variations in carbon dioxide content of the atmosphere, except in the cases of closed or unventilated compartments, have little or no significance in ventilation afloat or ashore. Even very low rates of room ventilation will serve to supply oxygen needs and eliminate

carbon dioxide, provided there is no source of contamination other than the individual.

26. *Carbon Monoxide.*

(a) Carbon monoxide can exist in dangerously high concentrations as a result of fires, or as a result of careless use of portable or mobile gasoline combustion engines.

(b) Ventilation rates have been carefully planned for tank and vehicle-carrying craft to control the maximum anticipated carbon monoxide exposures when the engines of all tanks and vehicles are operating. Hangar deck spaces of aircraft carriers are similarly provided with adequate ventilation to maintain within safe limits the concentration of carbon monoxide.

(c) The following will serve as an approximate method of anticipating the effects of exposure to varying concentrations of carbon monoxide:

Time of exposure v. concentration rule:

(1) Time of exposure in hours multiplied by the concentration in parts per 10,000 equals 3 (no perceptible effect).

(2) Time of exposure in hours multiplied by the concentration in parts per 10,000 equals 6 (just perceptible effect).

(3) Time of exposure in hours multiplied by the concentration in parts per 10,000 equals 9 (headache and nausea).

(4) Time of exposure in hours multiplied by the concentration in parts per 10,000 equals 15 (dangerous to life).

(d) Symptoms in relation to concentration of carbon monoxides:

(1) 0.01 percent or 1 part in 10,000 No symptoms for 2 hours.

(2) 0.04 percent or 4 parts in 10,000. No symptoms for 1 hour.

(3) 0.06 to 0.07 percent or 6 to 7 parts in 10,000. Headache and unpleasant symptoms in 1 hour.

(4) 0.10 to 0.12 percent or 10 to 12 parts in 10,000. Dangerous after 1 hour

(5) 0.35 percent or 35 parts in 10,000. Fatal in less than 1 hour.

(e) In the Hudson River tunnels, for example, a concentration of 4 parts of carbon monoxide per 10,000 is permissible for a truck passing through in 45 minutes. This means 4 multiplied by 0.75 equals 3, a concentration devoid of annoyance to the driver.

27. *Bacteria.*

(a) Living pathogenic microorganisms, which may exist in the atmosphere, must be controlled principally by ventilation. It has been demonstrated that droplets produced from sneezing, coughing, spitting, etc., if of sufficiently small size (under 0.1 mm diameter), will be evaporated before settling to the floor. The nuclear residue may persist in the atmosphere for an indefinite time thereafter, and may represent a source of infection to other people.

(b) Methods for sterilization of air are not yet available as a practical defense measure against this possible source of air-borne infection.

28. *Odors.*

(a) The physiologic effect of odors given off by human bodies, and by various organic processes and substances, is not clearly defined. There is reasonably clear evidence that such odors bear an influence upon appetite, and as such they are of real hygienic significance. Man has an acute ability to detect odors in concentrations so small as to be immeasurable by chemical or physical means. Attempts to filter unpleasant odors, or to mask them by substitution of a more agreeable odor, have met with only partial success.

(b) However, whether the effect of disagreeable odors is physiological or esthetic, the fact remains that odors do result in decreased appetite and a disinclination to physical activity. Ventilation rates to eliminate odors from berthing and living quarters are considerably in excess of those required to supply oxygen and eliminate carbon dioxide.

29. *Tobacco Smoke.*

(a) Tobacco smoke constitutes one of our most difficult problems, particularly in sealed spaces in ships and in the submerged submarine where the air is recirculated.

(b) The effects of smoke are due to the nicotine absorbed

by the body, the odors particularly of stale smoke, and to irritation of the eyes and respiratory tract. The presence of appreciable amounts of carbon monoxide accompanying the smoke has been under investigation. Without discussing the familiar toxic symptoms, of salivation, nausea, impending sweat, and a feeling of exhaustion and palpitation, it should be pointed out that tolerance for tobacco varies greatly, and that young individuals are more susceptible than adults. Some individuals appear to be allergic to tobacco smoke.

(c) Although the acquisition of tolerance protects against unpleasant symptoms within limits, it is certain that the smoke in the rebreathed air of the enclosed spaces will exert its full harmful effect upon personnel not habituated to the usage of tobacco. It follows that under these conditions the usage of tobacco is to be interdicted.

(d) Apart from its inherently toxic effect, tobacco smoke, by virtue of its accelerative influence on pulse rate, acts as a complicating variable to confuse estimates of cardiovascular fitness and response to deleterious environment expressed in terms of pulse rate.

30. *Physical Measurements.*

(a) While Medical Department personnel need not attempt to describe in detail the physical characteristics of the prevailing shipboard atmosphere, nevertheless, in order to evaluate properly the ventilation aboard ship in terms of its physiologic effects, certain minimum physical measurements are necessary.

(b) In offering constructive criticism on ventilation, the compartment or section of the ship about which the comments are concerned should be identified in the following manner:

- (1) Compartment name and number.
- (2) Approximate location.
- (3) Approximate dimensions.
- (4) Principal use of compartment.
- (5) Average number persons occupying compartment.
- (6) Other relevant data such as heat producing machinery within compartment, adjacent hot spaces, etc.

(c) The ventilation system of the compartment in question should be described briefly with the following information supplied:

(1) Is mechanical or natural ventilation used for air supply? Exhaust?

(2) If the information is available give the total volume of air supplied to or exhausted from the compartment.

(3) Number of bracket fans installed.

Lighting

1. Seeing is a decidedly complex process involving many variable factors. The physical construction and the age of the eyes doing the seeing, the extent to which optical errors are corrected, the degree of nervous tension, the number, potency, and the nature of distractions competing for the attention of the observer, and many other physiological and psychological factors combine to determine how well an individual will see under given circumstances.

2. *External factors.* More easily appraised than such intangible factors are the four external factors affecting the visibility of any object. These are size, brightness, contrast, and time.

(a) Size.—Visual size is usually expressed in degrees and refers to the angle at the eye subtended by an object. Thus the visual size of an object depends upon its actual size and its distance from the observer. The smallest object that can be seen by the normal eye, under the most favorable conditions, will subtend an arc of slightly less than one minute. In general, the larger the visual size of an object, the greater its visibility.

(b) Brightness.—Seeing occurs when light emitted or reflected from objects in the field of view enters the eye and is focused on the retina. Naturally, as the amount of light entering the eye is increased, the visual sensation becomes stronger; i. e., the scene or object looks brighter. The brighter an object, the greater its visibility.

(c) Contrast.—If there were no gradations in brightness or color, the eye would be unable to distinguish objects from their background. Contrast is necessary not only to

enable the eye to detect the presence, size, and shape of objects, but also to reveal every detail that can be seen. In general it can be said that visibility improves as contrast is increased. Thus, for example, other things being equal, black print on white paper is easier to read than black print on gray paper because the former combination represents the greatest attainable brightness contrast in ordinary printing between object of interest and background.

(d) Time.—The eye cannot register an accurate image if the time available for seeing is too short.

3. The Bureau of Ships has initiated a lighting-improvement program designed to give an increase in foot-candle level. This is effected through better arrangement of present fixtures, modification of standard lighting fixtures providing practically glareless illumination, removal of shadows, and more light output. Also fluorescent lighting, comparable to that in use ashore, has been adopted for extensive shipboard use to decrease heat and improve efficiency, and on newly constructed ships improved incandescent-type fixtures are provided in the ship's berthing spaces.

4. A complete coverage of lighting and lighting fixtures appears in *Bureau of Ships Manual*, chapter 64.

INSTRUCTION TEST

Assignment No. 21

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. The medical officer shall make routine inspections of barracks in order to maintain Navy standards of
2. Ventilation aboard ship during hot weather serves a dual purpose, the cooling and of vital air.
3. Heating aboard ship is accomplished by drawing fresh outside air over and discharging the heated air into the various compartments.
4. Acute overheating may lead to four syndromes: , heat exhaustion, super-dehydration, and heat cramps.
5. The machinery of the firerooms and machinery spaces produce so much "wild heat" that in order to reduce the temperature, cooling is provided personnel on duty.

6. Naval ventilation is designed to maintain an atmosphere conducive to physical of personnel.
7. Compartments such as galleys, laundries, heads, etc., which produce heat or undesirable odors, are provided with a greater volume of mechanical than supply.
8. In typical heat stroke, cessation of is one of the very early signs of trouble.
9. Replenishment of salt loss through the skin as a result of sweating is best obtained by adding salt to the
10. It is important that Medical Department personnel be familiar with the fundamentals of heating and ventilation so that they may interpret the properly.
11. The maximum air velocity which can be tolerated comfortably by the human body in warm atmospheres is about to feet per minute.
12. Marked improvements in temperature conditions aboard ship can be effected in compartments directly under the weather decks by the decks.
13. Fluorescent lighting, comparable to that in use ashore, has been adapted for extensive shipboard use to decrease and improve
14. In hot weather, bracket fans should be used to provide high local

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

15. In dormitories or sleeping rooms ashore, the minimum square feet of floor space per man is
 1. 20
 2. 30
 3. 50
 4. 70

16. In berthing compartments aboard ship, the minimum square feet of floor space per man is
 1. 12
 2. 16
 3. 24
 4. 32

17. Matters of material relating to heating, ventilation, and air conditioning on shipboard come under the cognizance of the
 1. Bureau of Medicine and Surgery
 2. Bureau of Naval Personnel
 3. Bureau of Yards and Docks
 4. Bureau of Ships

18. When exposed to extreme cold the part of the body possessing the poorest circulation is the
 1. face
 2. feet
 3. hands
 4. torso
19. Living pathogenic microorganisms, which may exist in the atmosphere, must be controlled principally by
 1. fumigation
 2. filtration
 3. ventilation
 4. sterilization

INSTRUCTION TEST

Assignment No. 22

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. Seeing is a decidedly complex process involving four external factors; size, brightness, contrast, and
2. All void spaces, storage tanks, storerooms containing fresh fruit or vegetables, and storerooms in which the ventilation has been shut down for a day or more, should always be considered as potentially deficient in the required amount of
3. Air movement, applied to heating and ventilating rooms, refers to air currents at any given point in a room.
4. The weight added, the space occupied, and the power consumed by the ventilation, heating and cooling arrangements on a naval vessel must be at the expense of other necessities.
5. Carbon monoxide can exist in dangerously high concentrations as a result of fires or as a result of careless use of portable or mobile engines.
6. The components by which any atmosphere can be fully described are dry and wet bulb temperatures, wall surface temperature, moisture content or relative humidity, and air
7. In the design and specification of ventilation and heating equipment aboard ship important governing factors are, weight, and power requirements.
8. To maintain an induced air flow to compartments used for living, berthing, etc., they are provided with a greater volume of mechanical than exhaust.
9. Mechanical cooling and dehumidification of air aboard naval vessels is accomplished by passing air through coils containing a suitable or refrigerant.

10. The heating and ventilating systems of naval vessels must be designed to provide for climatic conditions ranging from the ----- in winter to the ----- in summer.
11. Effective temperature is an index or series of humidity-temperature conditions, rather than a ----- measurement.
12. Cooling by ventilation is a process of diluting inside air with ----- air, therefore it is not possible to cool a space by dilution to a temperature ----- than that of the outside air.

MULTIPLE CHOICE ITEM

In the following statements or questions place the number preceding the correct answer in the blank space provided.

13. In bunkrooms and crew's berthing spaces aboard naval vessels one fan is provided for each
 1. 100 square feet of deck area
 2. 150 square feet of deck area
 3. 240 square feet of deck area
 4. 300 square feet of deck area-----
14. In all dormitories or sleeping rooms on shore stations the minimum distance between heads of sleeping men is
 1. 5 feet
 2. 7 feet
 3. 8 feet
 4. 10 feet-----
15. Living spaces aboard naval vessels are designed to be maintained, during cold weather, at a temperature of
 1. 65 degrees F.
 2. 68 degrees F.
 3. 70 degrees F.
 4. 75 degrees F.-----
16. In berthing compartments aboard naval vessels the minimum distance between heads of sleeping men is
 1. 3 feet
 2. 5 feet
 3. 7 feet
 4. 8 feet-----

MATCHING ITEMS

To the right of each phrase or symbol in list B write the number of the one most closely related item in list A.

17. Match the plumbing fixtures in barracks with the number of men to be accommodated.

A	B
1. lavatories	1 for every 25 men -----
2. urinals	1 for every 20 men -----
3. showers	4 linear feet for every 20
4. scrub decks	men -----
5. water closets	1 for every 15 men -----
6. dental lavatories	1 basin or 2 feet of trough
	lavatory or wash sink
	for every 5 men -----

18. Match the plumbing fixtures aboard naval vessels with the number of men to be accommodated.

A	B
1. 1 fixture for 60 crew or 75 troops	lavatories -----
2. 1 for every 18 crew or 25 troops	urinals -----
3. 1 basin or 2 feet of trough for 15 men	water closets -----
4. 1 fixture or 20 inches of trough for 40 crew or 50 troops	showers -----
5. 1 for every 20 men	

19. Match the following symptoms in relation to concentration of carbon monoxide.

A	B
1. 0.01 percent or 1 part in 10,000	headache and unpleasant symptoms in one hour -----
2. 0.35 percent or 35 parts in 10,000	fatal in less than one hour -----
3. 0.10 to 0.12 percent or 10 to 12 parts in 10,000	dangerous after one hour -----
4. 0.04 percent or 4 parts in 10,000	no symptoms for 2 hours -----
5. 0.06 to 0.07 percent or 6 to 7 parts in 10,000	

INSTRUCTION TEST

Assignment No. 23

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. The relative humidity of incoming air during summer ventilation is the same as that of the
2. Scrub decks for clothing, when located in the latrine buildings, shall be in an entirely separate compartment with separate
3. When designing a heating or ventilating system aboard ship it is essential to preserve the structural integrity of the ship, and penetration of the main structure must be kept at an absolute minimum.
4. One of the most important purposes for which the ventilation system was designed is to eliminate visible sweating of personnel while at
5. Personnel working in boiler rooms or firerooms are particularly prone to heat cramps because of their excessive perspiration and rapid loss.
6. Certain workshops, laboratory spaces, and compartments containing precision instruments may require or humidity control, or both.
7. Exposure to cold and to change in temperature lowers the resistance of animals to
8. Air blowing at high velocities from the overhead onto the heads of occupants is undesirable except in atmospheres.
9. BuShips' working standard for living spaces is to provide sufficient air to maintain the dry bulb temperature not more than degrees higher than that of the weather air.
10. Aboard naval vessels, to bunking arrangement shall be used.
11. The officer in charge of should ascertain that the proper allowance of bracket fans is aboard ship and in operation.
12. The dry bulb temperature of air is that temperature recorded by any ordinary, the reservoir or bulb of which is dry and not affected by the cooling effect of evaporation of moisture.
13. The moisture content of the atmosphere is usually expressed in terms of of moisture per pound of dry air.
14. The temperature which a thoroughly wet body will attain if the air passes over it for a sufficient length of time and with a high enough wind velocity is the temperature.

15. The ratio of the amount of water vapor the air *does* contain under existing conditions to the amount of water vapor the air *could* contain at the same dry bulb temperature when saturated is known as -----.
16. When the wet and dry bulb temperatures are the same, it can be said that the air is ----- or that the relative humidity is 100%.

MULTIPLE CHOICE ITEMS

In the following questions or statements place the number preceding the correct answer in the blank space provided.

17. One of the items listed below is *not* a means of elimination of waste heat by the body
1. by radiation to cooler objects
 2. by convection
 3. by evaporation of perspiration
 4. by inspiration
-
18. The minimum requirements of room space per man in all dormitories or sleeping rooms is
1. 200 cubic feet
 2. 300 cubic feet
 3. 450 cubic feet
 4. 475 cubic feet
-
19. The minimum requirements of air space per man in berthing compartments aboard ship is
1. 120 cubic feet
 2. 150 cubic feet
 3. 200 cubic feet
 4. 300 cubic feet
-

FUMIGATION: METHODS AND PROCEDURES

CONTROL OF RODENT AND INSECT INFESTATION ABOARD SHIP

Fumigation

(1) Recent developments in disinfestation and deratization render the fumigation of ships as a routine procedure rarely necessary. Rodent control will ordinarily be effected by the more simple and usually equally effective procedure of baiting and trapping. Every effort to reduce rats by trapping shall be made before resorting to more dangerous methods, unless health is immediately threatened. The destruction of insects, particularly lice, will ordinarily be carried out by the use of DDT preparations. Fumigation is never indicated for the control of cockroaches, bedbugs, flies, lice, ants, etc. In rare instances it may be used in food storerooms against flour moths, bean beetles, etc.

(2) In the relatively rare instances when fumigation for rodent control is deemed essential, the procedure ordinarily shall be requested of and undertaken by the U. S. Public Health Service, which alone is permitted to use hydrogen cyanide gas or methyl bromide. This service will be rendered without charge by application to U. S. Public Health Service representatives located in all major United States ports, if in the opinion of the U. S. Public Health Service a health problem exists. If fumigation is done at Navy insistence and a health problem is deemed not to exist, the Navy will be asked to furnish the U. S. Public Health Service with the

requisite amount of fumigant, or, when this is impracticable, to reimburse the U. S. Public Health Service for the cost of the fumigant used.

(3) The use of naval personnel to perform fumigation is apt to prove both dangerous and inefficient. However, when such becomes mandatory, the fumigation will be done in accordance with the detailed instructions contained in *Bureau of Ships Manual*.

Carboxide Gas Fumigation

(1) The only fumigant authorized for shipboard use by naval personnel is carboxide gas. When used in the prescribed concentrations, with the ship properly sealed, it is an effective insecticide and rodenticide, although it is of such low toxicity that it may be applied aboard ship by naval personnel without undue hazard, with a minimum of interference with the routine of the ship, and without interfering with the scheduled operation of the ship. Fumigation by carboxide gas is authorized under the following conditions.

(a) Where in the opinion of the commanding officer, deratization is urgently needed in ports where United States Public Health Service facilities and personnel are not available for conducting hydrocyanic acid gas fumigation.

(b) Where required for control of insects in foodstuffs. Fumigation solely for the control of insects shall be undertaken only for the eradication of moths, weevils, or beetles in dry food stores aboard ship where other means of control are not practicable. Infested dry foodstuffs should preferably be returned to shore-based supply depots for fumigation under the supervision of specialists, if such facilities are available and it appears economically feasible to do so. Foodstuffs beyond salvage should be surveyed in accordance with *U. S. Navy Regulations*.

Carboxide Gas, Source of Supply

Carboxide gas shall not be carried on board naval vessels as a part of regular allowance equipment. When required, it should be obtained by requisition to the nearest naval shipyard or station.

Carboxide Gas Containers

The carboxide gas is delivered in steel cylinders of 30 and 60 pound capacity. In ordering, consideration should be given to the capacity which can be most advantageously and economically utilized in the spaces to be fumigated. The cost of the carboxide, when obtained, will be chargeable to the ships' regular quarterly construction and repair allotments.

General Data On Carboxide Gas

(1) Composition and physical properties: 10 percent of ethylene oxide and 90 percent of carbon dioxide, both components being 1.5 times as heavy as air. The ethylene oxide is the insecticidal fraction; the carbon dioxide markedly accelerates the respiration of the insects and hence renders the ethylene oxide more effective by increasing the speed of its absorption by the insects. The pressure of a full cylinder is 725 pounds per square inch at 70 degrees F., the mixture issuing as a liquid breaks down to a fine mist and completely vaporizes within a few minutes. The gas has a faint but distinct etherlike odor easily recognized in the concentration set up for fumigation. The gas is noninjurious to clothing, gold braid, furniture, or food products.

(2) Concentrations for insects: Six pounds per 1,000 cubic feet for an exposure period of 3 hours, based on the gross cubical contents.

(3) Hazard for man: The hazard in concentration set up for fumigation is comparatively slight as compared with hydrocyanic acid gas, the toxicity as estimated from animal experiments being only about one-fiftieth of that for hydrocyanic acid gas. However, there is risk of headache, nausea, and vomiting if personnel violate the simple precautions outlined hereunder in regard to entering spaces that have not been adequately aerated following fumigation. Death has resulted from the failure to use oxygen rescue-breathing apparatus when entering spaces containing concentrated quantities of the gas.

(4) Closure of ship's spaces: Closure should be as airtight as possible in order to reduce leakage of carboxide to a minimum.

(a) Ventilating system (supply and exhaust): Ventilating ducts should be disconnected at the points of entrance to compartments, wherever practicable, and watertight covers applied. Otherwise, the dampers of all terminals must be closed and the louvers plugged with damp rags or waste.

(b) Special measures: Commercial masking tape should be utilized for the sealing of door seams and various cracks and crevices. It adheres effectively and leaves no residue on removal. Wrapping paper coated with engine grease or vaseline, sealed at the edges with masking tape, is satisfactory for the closure of larger openings such as door louvers, the grill work of staterooms, and food carrier openings.

(5) Diffusion: Proper diffusion of the fumigant throughout the space or spaces is essential. This will be accomplished by the operation of ordinary fans alone, or combined with portable ventilating sets.

(6) Open flame heaters or exposed element electric heaters should not be used in areas being fumigated. In the presence of relatively high temperatures, such as may be locally produced by such devices, the ethylene oxide content of carboxide may break down chemically, lose its fumigating properties, and create a condition of inflammability not existent in the original fumigant. This hazard is not involved in the use of electrical circulating fans or portable ventilating sets to produce diffusion of the fumigant throughout the area. Special carboxide vaporizing nozzles should always be used. Under no circumstances should tubing or hose made of rubber be used with carboxide. Any added connections must be of metal and suitable for working pressures of 800 pounds per square inch.

Instructions For Use Of Carboxide Gas

(1) Preparation for fumigation:

(a) Penetration: Open wide all locker doors, furniture drawers, file cases, etc., and remove covers from mattresses and pillows in order to facilitate maximum access of the fumigant.

(b) Ventilating system: Stop and seal as indicated above.

(c) All openings sealed: Seal any opening which might permit gas to escape. Utilize masking tape or a combination of greased paper and masking tape, for magazine vents, voice tubes, radio leads, enunciator chain leads, nonwater-tight doors, natural ventilators, etc. Close all drains in heads and bathrooms. Dog down all watertight doors and air ports.

(d) Diffusion: Start all fans in space or spaces to be fumigated. If desired to further facilitate diffusion, also utilize portable ventilating sets so arranged as to make suction from areas tending to contain dead air. This arrangement will also facilitate aeration later.

(e) Handling of carboxide cylinders: Determine the cubical content of the space or spaces to be fumigated. Calculate the weight of carboxide required on the basis of 6 pounds per 1,000 cubic feet. There is no objection to exceeding this concentration except the additional cost and greater time required for aeration. Place the cylinders and so direct the nozzles that the maximum concentration of the gas is first released in the area known to be infested. Carboxide may stain fabrics or painted surfaces if discharged directly on them. For this reason the cylinders should be located so that the gas outlet is at least 5 feet from any fitting or structure. Securely lash all cylinders in an upright position because the violent discharge of gas tends to unbalance them. To avoid static sparks, the cylinders must be grounded before discharging gas.

(f) Safety precautions: Make certain that all personnel in the area are accounted for. Test all cylinders in advance to make certain that all valves can be opened by hand. In some cases a wrench may be necessary to loosen valves. When all preparations are complete and all openings to the spaces closed, except the exit, open wide the valves of the cylinders successively, beginning with the one farthest away from the point of exit. Keep the nozzles of the cylinders directed away from the operator.

(2) Aeration after fumigation: Open the area fumigated

at the end of 3 hours. Detail personnel wearing oxygen rescue-breathing apparatus to open all air ports and other connections to the outside air and start supply and exhaust ventilation. Maintain fans and portable ventilating sets in operation during the period of aeration. The time required for adequate aeration will vary according to the status of the ventilation, both natural and artificial, of the various parts of the area fumigated. It will ordinarily be safe for personnel to enter for their normal activities 2 hours after full ventilation has been in progress. However, this period should be determined by the officer in charge of the fumigation in conjunction with the medical officer. Particular care should be taken to clear spaces containing dead-air pockets where the odor of carboxide tends to persist. Storerooms and other poorly ventilated spaces should not be entered until the following day.

(3) Precautions for personnel:

(a) Working party: Members of the working party detailed to open carboxide cylinders or to handle details connected with the clearing of the area of gas after fumigation shall wear oxygen rescue-breathing apparatus.

(b) General personnel: The personnel in general will not be permitted to resume their normal activities in the space or spaces following fumigation until authorized by the fumigating authority.

Note: Instructions for using carboxide gas are also contained on a card attached to the cylinder. Read instructions carefully.

INSTRUCTION TEST

Assignment No. 24

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. Recent developments in disinfestation and deratization procedures render of ships as a routine procedure rarely necessary.
2. Rodent control aboard ships will ordinarily be effected by more simple and usually equally effective procedures of and rather than by fumigation.

3. The destruction of insects, particularly lice, will ordinarily be carried out by the use of preparations.
4. Fumigation is never indicated for the control of cockroaches, bedbugs, flies, lice, ants, etc.; however, in rare instances it may be used in storerooms against flour moths, bean beetles, etc.
5. When fumigation for rodent control is deemed necessary, the procedure ordinarily shall be requested of and undertaken by the U. S.
6. Detailed instructions for the fumigation of naval vessels are contained in the of Manual.
7. The only fumigant authorized for shipboard use by naval personnel is gas.
8. When used in proper concentration, with the ship properly sealed, carboxide gas is an effective insecticide and
9. Shipboard foodstuffs which are so infested with insects that they are beyond salvage should be in accordance with U. S. Navy Regulations.
10. In preparing shipboard spaces for fumigation with carboxide gas, closure of the spaces should be as as possible to reduce leakage of gas to a minimum.
11. In preparing shipboard spaces for fumigation with carboxide gas, the supply and exhaust system must be secured.
12. In preparing shipboard spaces for fumigation with carboxide gas, the door seams and various cracks and crevices should be sealed with commercial
13. Ordinary electric fans and portable ventilating sets should be used in spaces being fumigated with carboxide gas to promote proper of the gas.
14. Open flame heaters or exposed electric heaters should not be used in spaces being fumigated with carboxide gas.
15. In fumigating with carboxide gas, a special carboxide vaporizing should be used, and under no circumstances should tubing or hose made of be used.
16. In preparing spaces for fumigation with carboxide gas, all locker doors, furniture drawers, and file cases should be
17. Carboxide gas cylinders which are standing on linoleum or other insulating deck covering must be before discharging gas in order to avoid static sparks.
18. The officer in charge of the fumigation detail, in conjunction with the officer, should determine when spaces have been sufficiently ventilated, following fumigation with carboxide gas, for personnel to enter for normal activities.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

19. The destruction of insects on board ship will ordinarily be carried out by the use of
1. fumigating gases
2. DDT preparations
3. alcoholic preparations
4. insect repellents -----
20. The U. S. Public Health Service personnel are the only personnel permitted to
1. fumigate naval vessels with hydrogen cyanide gas
2. fumigate naval vessels with carboxide gas
3. fumigate foodstuffs on board naval vessels
4. bait and trap rats on board naval vessels -----
21. Shipboard foodstuffs which are infested with insects, but are salvageable, should be
1. destroyed
2. used immediately
3. fumigated by U. S. Public Health Service personnel
4. returned to shore-based supply depots for fumigation -----
22. When required for shipboard fumigation, carboxide gas is obtained from
1. the regular shipboard allowance of gases
2. the nearest naval shipyard or station
3. the U. S. Public Health Service
4. the nearest naval medical supply depot -----
23. The cost of carboxide gas, when obtained for shipboard use, will be chargeable to
1. Medical Department allotments
2. welfare funds
3. regular ships' construction and repair allotments
4. Medical Department supply depot drawing accounts -----
24. In the concentration set up for fumigation, carboxide gas has a faint but distinct odor resembling
1. ether
2. chlorine
3. sulfur
4. nitrous oxide -----

25. Recommended concentration of carboxide gas for shipboard fumigation is 6 pounds of gas per 1,000 cubic feet, based on the gross cubical contents, for an exposure period of
1. one hour
 2. three hours
 3. twelve hours
 4. twenty-four hours -----
26. In the concentration set up for fumigation, the toxicity of carboxide gas for man is
1. about twice that for hydrocyanic acid gas
 2. about the same as that for hydrocyanic acid gas
 3. about one-half that for hydrocyanic acid gas
 4. about one-fiftieth that for hydrocyanic acid gas -----
27. When using carboxide gas for fumigation, the only objectionable result of exceeding the recommended concentration of 6 pounds per 1,000 cubic feet of space is the
1. harmful effects on clothing and furniture
 2. additional cost and greater time required for aeration
 3. increased danger of fire
 4. increased danger of explosion -----
28. Personnel detailed to open airports and restore ventilation in spaces that have been fumigated with carboxide gas should wear
1. protective clothing
 2. gas masks
 3. oxygen rescue-breathing apparatus
 4. dark glasses -----
29. Well ventilated spaces that have been fumigated with carboxide gas are ordinarily safe for personnel to enter for normal activities, after full ventilation has been in progress for
1. 30 minutes
 2. 45 minutes
 3. 60 minutes
 4. 120 minutes -----
30. Storerooms or other poorly ventilated spaces that have been fumigated with carboxide gas should not be entered for normal activities
1. for 2 hours after fumigation has been completed
 2. for 8 hours after fumigation has been completed
 3. until the following day after fumigation has been completed
 4. until one week after fumigation has been completed -----

CHAPTER

7

PERSONNEL RECORDS AND ACCOUNTING

PREPARATION OF PATIENT ADMISSION RECORDS

A. The Admission Unit

Operation of the admission unit in a naval hospital is a function of the personnel-records division. Since the work performed in this unit is the initial phase of the entire procedure for processing patients' records, it is vitally important that all data be recorded accurately. Errors made in the admission unit are carried over into other sections of the hospital and are often difficult to detect and correct.

It is important that all personnel detailed in the admission unit be thoroughly familiar with the various provisions of admission authority pertaining to different categories of patients. Much difficulty is caused by admission of ineligible persons. Inexperience and inaptitude of admission unit personnel cause most of these admissions. It is much easier to prevent an ineligible person being admitted than to effect the removal of an ineligible patient after admission.

The primary function of the admission unit is to provide facilities to determine the eligibility of patients for admission to the hospital and to open the necessary admission records.

Contagious cases are not usually admitted through the regular channels of the admission unit. Procedure will vary locally, but some provisions will be made for admission of these cases through a separate room, admission ward, or some other part of the hospital. Clerical procedures for these cases will be the same as for other patients.

The commanding officer has the authority to authorize the admission of any person for humanitarian reasons in an emergency.

Patients who identify themselves as eligible for hospitalization but do not present proper credentials may be admitted on the basis of their identification. Questionable cases should be referred to the officer of the day for decision. A written report should be made in all cases when persons apply for admission and are refused.

Objectives of the admission unit are:

1. To screen all individuals applying for hospitalization and admit only those eligible.
2. To standardize the admission routine of the hospital.
3. To eliminate duplication of work.
4. To examine, diagnose, and assign patients to appropriate wards.
5. To open all required forms and records.
6. To distribute records and personal effects to the proper places.

B. Personnel Eligible For Hospitalization: Credentials And Records

1. U. S. Navy and U. S. Marine Corps

(a) Active Duty—Officers and Enlisted Personnel

(1) Credentials and Records:

a. Records accompanying navy patients usually consist of:

1. Officers—Orders
Enlisted—Standard Transfer Order
2. Health Record
3. Service Record
4. Pay Record
5. Enlisted-Disciplinary Status Letter (BPM C-7811)

b. Marine patients may have a health record only

c. Identification—In cases other than the above, identification may be established by leave papers or identification card. For officer personnel verify against the

Register of Commissioned and Warrant Officers of the U. S. Navy and U. S. Marine Corps.

Officers will be informed that they will be required to pay cash subsistence at the current rate payable at the end of each month, or upon discharge.

2. In-Patient Care of Service Patients other than Navy or Marine Corps on Active Duty

(a) U. S. Army and U. S. Air Force

(1) Active Duty—Officers and Enlisted Personnel

a. Credentials and Records:

1. Establish identity (no written request required for admission in a naval hospital). Admission to infirmaries will be by signed request of the member's unit commander.

2. Accompanying records will vary according to local policy; send all records and papers to record office.

(b) U. S. Navy and U. S. Marine Corps: Inactive Duty

(1) Enlisted (Fleet Reserve and Retired):

Officers (Retired with pay)

a. Credentials and records:

1. Will not be accompanied by records; pay accounts are carried by Field Branch, BuSandA, Cleveland (Navy): for MarCorp, Disbursing Branch, MarCorp, Washington, D. C. Inform officers they will be required to pay cash subsistence at the current rate payable at the end of each month, or upon discharge.

(c) U. S. Army and U. S. Air Force (Retired with pay) including Reserve Components

(1) Credentials and Records:

a. Will not be accompanied by records.

b. Establish eligibility through proper identification. Inform the officer or enlisted man that he will be required to pay cash subsistence at the current rate payable at the end of each calendar month or on discharge from the hospital.

(d) Personnel Permanently Retired for Physical Disability (Exec. Order 10122 dtd 14 APR 1950)

(1) Credentials and Records:

a. After 1 October 1950 all personnel permanently retired for physical disability who need hospital care for

chronic arthritis, tuberculosis, psychiatric or neuropsychiatric disorders, malignancy or paraplegic shall be hospitalized under the cognizance of the Administrator of Veterans Affairs.

b. Personnel of this category who apply for admission to a naval hospital will be referred to the Veterans Administration.

(e) U. S. Navy and U. S. Marine Corps Reserve Components; Benefits under P. L. 108, 81st. Congress

(1) Eligibility—disabling cause must occur *in the line of duty* while the reservist is serving on active duty, active duty for training, or inactive training duty. (Public Law 108, 81st. Congress.)

a. Any reservist who, at the time he is disabled, is serving under orders to active duty for an indefinite period, or for a period in excess of thirty days, is entitled to benefits whether the cause of his disability is disease or injury. (BPMH-1804)

b. Any reservist who, at the time he is disabled, is serving under orders to active duty for training or inactive training duty, is entitled to benefits only if the disability is caused by injury.

1. When disability is caused by disease, he may receive treatment or hospitalization for ten weeks after discharge from active training duty or inactive duty for training. (BPMH-1804)

(2) Credentials and Records:

a. Reserve personnel ordered to active duty for an indefinite period or for a period in excess of thirty days are handled as regular navy.

b. Reserve personnel ordered to training duty of any duration or to active duty for a period of thirty days or less rate hospitalization and treatment. Admission credentials—Records and orders.

(1) Majority of reserves in this category will be admitted for disease; if injured the reservist may elect benefits under P. L. 108, BEC or VAB.

c. Reservists on inactive duty without pay do not

rate hospitalization in a naval hospital and may be admitted only as civilian humanitarian cases.

(f) Members, Reserve Components, U. S. Army and Air Force (Except those retired with pay and BEC or VAB)

(1) Credentials and Records:

a. Written request of the individual's commanding officer or other authorized representative of the U. S. Army or Air Force.

(g) Naval Pensioners

(1) Credentials and Records:

a. By application and proper identification, such as pension certificate. This category *does not* include Veterans Administration pensioners.

(h) Beneficiaries Naval Home

(1) Credentials and Records:

a. Written request by the Governor of the Naval Home, Philadelphia, Pennsylvania. (On emergency admission notify the Governor of the Naval Home.)

(i) Former Members Navy and Marine Corps Retained After Discharge or Separation

(1) Retained for medical treatment after expiration of enlistment or separation.

(2) Maternity Cases—Women personnel honorably discharged or separated from the service while pregnant are eligible for medical care during such pregnancy and confinement. Pregnancy must be determined by a naval medical officer or a reputable civilian physician to have existed at time of discharge or separation.

a. Credentials—Enlisted Women: Photostat of discharge certificate. Women officers: Certified copy of orders of separation from the service.

(j) Officer Candidates (Includes NROTC, Platoon Leaders Class, Reserve Officer Candidates, Aviation Midshipmen)

(1) Credentials and Records:

a. Orders to active duty.

3. In Patient Care other than Service Patients

(a) Dependents of Members of the Armed Forces on

active duty and retired with pay (includes U. S. Army and U. S. Air Force)

(1) Dependents of male personnel who rate hospitalization benefits are:

- a. Lawful spouse.
- b. Unmarried dependent children under twenty-one years of age.
- c. Unmarried dependent children over twenty-one who are mentally defective or physically incapacitated, providing they are dependent for over half their support.
- d. Widows of deceased personnel who have not remarried.
- e. Parents if they are in fact dependent. The term parent shall include a stepparent, parent by adoption, and any person, including a former stepparent who has stood in loco parentis to the person concerned for a continuous period of not less than five years during the minority of such member.

(2) Dependents of female personnel who are eligible for hospitalization benefits are:

- a. All the above, but only when the husband and/or children are dependent for over half their support. (BPM A-4403)
- b. The following are not eligible for admission or to receive dependent benefits in a naval hospital:
 1. Dependents of reserve personnel, inactive or on training duty.
 2. Dependents of personnel under confinement awarded by a general court-martial whose enlistment has expired or whose dismissal from the service has been accomplished.
 3. Dependents of Coast Guard personnel, unless the Coast Guard is operating as part of the navy.
 4. Widows of deceased personnel who have remarried.

(3) Credentials and Records:

- a. Dependents identification card.
- b. Identification of dependents of Army and Air Force personnel may be established by a current commissary

permit or a post exchange permit. Naval medical activities are authorized to accept this identification.

c. If dependents are received from another hospital or infirmary, they will be accompanied with clinical records. Make notification of records received on reverse of the Admission Record.

(b) Veterans Administration Beneficiaries

(1) Credentials and Records:

a. For routine admission, veterans will present VA Form 3-3542, Authorization to Report, properly signed by applicable Veterans Administration Regional Office or authorized representative. In lieu thereof, may present VA Form 10-2567, Authority for Furnishing Medical Service.

b. In the event of an emergency admission, establish entitlement from personal papers as completely as possible. If in same location as Veterans Administration Regional Office request telephonic authorization. Refer case to the officer of the day or the personnel officer before admitting. Complete VA Form 10-P-10, Application for Hospital Treatment or Domiciliary Care.

(2) Personnel on the Emergency Officers Retired List:

a. If a member of the Emergency Officer Retired List appears for admission, check the Army or Navy Register to establish identity, and then admit only as a Veterans Administration Beneficiary.

(c) U. S. Public Health Service Beneficiaries

(1) Categories eligible for admission:

a. Members, Regular Coast Guard, Active or Retired.

b. Members, U. S. Coast Guard Reserve, regular and temporary, active duty or retired for physical disability.

c. Commissioned officers of the Regular Corps of the Public Health Service, Active and Retired.

d. Commissioned officers of the Reserve Corps on active duty or retired for physical disability.

e. Employees and noncommissioned officers in the field service of the Public Health Service when injured or sick in the line of duty.

f. Officers and members of vessels of the U. S. Coast Guard and Geodetic Survey, Active and Retired.

g. Enrollees in the U. S. Maritime Service on active duty and members of the Merchant Marine Cadet Corps.

h. Cadets at State Maritime Academies or on State training ships.

i. Seamen on vessels of the Mississippi River Commission.

j. Members of vessels of the Fish and Wildlife Service.

k. Seamen employed on vessels of U. S. Registry or on vessels of the United States.

(2) Credentials and Records:

a. When the naval hospital is located near a U. S. Public Health Service medical relief station, quarantine station, or district office, but is not near a U. S. Public Health Service hospital should present the following credentials:

1. Treatment Authorization, USPHS Form 894 (HD)

This authorization will have been completed by the referring USPHS official Form NC-62522 signed by the member's commanding officer may be accepted in case of transfer of U. S. Coast Guard personnel. The Treatment Authorization, USPHS Form 894, should be attached to the original and two copies of the Clinical Record Brief, USPHS Form 484-1 (HD).

2. Clinical Record Brief, USPHS Form 484-1 (HD)

The date of admission shall be immediately typed on the Briefs, and one copy returned to the station authorizing the treatment.

a. USPHS beneficiaries who do not present proper admission credentials should be admitted only in genuine emergencies. Admission authorization should be obtained by telephone or telegraph.

(d) Registrants, Selective Service:

(1) Selective Service Registrants, acting upon orders issued under the Selective Service Law, shall be provided

emergency medical care, to include hospitalization. Hospitalization or medical care will be requested by the local Selective Service Official.

(e) Representatives of the American Red Cross:

(1) Accredited representatives of the American National Red Cross assigned to naval activities may be admitted on proper identification and by a request from the person.

(f) Beneficiaries, Bureau of Employees' Compensation (NCPI 88):

(1) Civil Service Employees

a. Credentials and Records:

1. Bureau of Employees' Compensation beneficiaries are entitled to hospitalization only when the disability is caused by or is a result of injury or occupational disease associated with their job. Admission credentials will consist of:

(A) BEC Form CA-16, Request for treatment of injuries under the U. S. Employees' Compensation Act.

(B) BEC Form CA-17, Request for treatment of injury under the U. S. Employees' Compensation Act, when cause of injury is in doubt.

(C) Letter request signed by official superior.

(g) Officers and Employees of the Government and Employees of a Federal Contractor Outside Continental U. S.

(1) Medical care and hospitalization may be provided at naval activities outside continental U. S. for the above category and their dependents only when reasonably accessible and appropriate nonfederal medical facilities are not available. Persons included in the above category are:

a. Officers and crews of the U. S. Airlines.

b. Shipwreck or enemy-action refugees.

c. Civilian marine employees of the Military Sea Transportation Service.

d. Humanitarian cases.

1. By request of the individual and proper identification.

2. Federal contractor employees must have a request signed by the contractor's agent.

3. Civilian humanitarian cases may be admitted at the discretion of the commanding officer.

(h) State Department Foreign Service, Officers and Employees

(1) An officer or employee of the Foreign Service of the State Department may be admitted to a naval hospital only on specific authority from the Bureau.

(i) Foreign Military Personnel

(1) A member of the military force of a foreign nation who, while in the U. S. in an active duty status, including North Atlantic Treaty Organization and Mutual Defense Assistance Program personnel, is injured or becomes ill may be admitted to any naval hospital for hospitalization.

(2) Credentials and Records:

- a. Request of the individual's commanding officer.
- b. Request of the Consular Representative.

C. Specific Instructions For Preparation of Admission Forms

1. Admission Record (NavMed 1285)

(a) Submission—Naval hospitals, hospital ships, and infirmaries providing in-patient care.

(b) Function—To provide a standard set of admission cards offering complete coverage of admission data required for any patient. The Admission Record is prepared on all admissions regardless of classification.

(c) Preparation—

Name—Enter surname, first name, middle name.

Hospital Register No.—Enter next serial number taken from the Register of Patients, NavMed HF-39. On readmissions, a new register number is assigned.

Previous Admission Date—Enter date of previous admission to the activity. If not applicable enter dashes in this space.

U. S. Naval Hospital—Enter name of activity.

Duty Status—Enter Act., Ret., Inact., etc.

Aviation Status—Enter status on admission if patient

is assigned duty involving flying. If not with aviation, enter dashes in this space.

Race—Enter one of the following race classification:

1. Caucasian, report as "C."
2. Negroid, report as "N."
3. Mongolian, report as "Mon."
4. Indian (American), report as "Ind."
5. Malayan, report as "Mal."

Puerto Rican (White), will be recorded as "C."

Puerto Rican (Negro), will be recorded as "N."

Chinese, Japanese, and Korean recorded as "Mon."

Filipino, Samoan, Chamarro, Hawaiian, record as "Mal."

The individual's nationality is not desired.

Sex—M for male, F for female.

Religion—C for Catholic, P for Protestant, H for Hebrew.

Marital Status—S for single, M for married, W for widowed, D for divorced.

Birth—Enter state in which born or country if foreign born, date of birth, and age at last birthday.

Present Enlistment Date—Enter date of current enlistment.

Expiration Date—Active military personnel enter date of expiration of current enlistment. Veteran Administration beneficiaries enter date of discharge from last period of service.

Total Service—Enter years and months as Yrs. Mos.

Admission—Enter official time and date of admission. This must be consistent on all forms prepared on each individual.

From—Official designation for the admission. If authorization is by letter, 10-P-10 (VetAdm), or telephone, check in parenthesis after applicable word.

Records—Mark "1" in the applicable block for each record received otherwise leave blank. When missing records are requested by the record office, date requested will be entered by that department on their copy.

Activity Notified—Emergency—If emergency admission by other than activity to which the patient is attached, enter means of notification, i. e., telephone, dispatch, speed-letters, etc.

How Patient Arrived—Enter transportation or type of conveyance in which the patient was received. If by commercial ambulance, enter name of the company or firm. If by government vehicle, do not enter name of activity furnishing the vehicle.

Officer's Pay Record Location: or Occupation if Veterans Administration Beneficiary—Pay records of USN retired officers are located at BuSandA, Field Branch, Cleveland, Ohio. Pay records of USMC retired officers are located at Disbursing Branch, MarCorp, Washington, D. C. If the patient is a VAB, enter occupation.

Government Insurance—Enter total amount as shown in DD 93.

Dependents—Enter PAMI code, i. e., W for wife, W1DC for wife and 1 dependent child, OD for other dependents, etc.

Next of Kin—Enter next of kin as shown on DD 93.

Telephone—Relationship—Enter telephone number and relationship of next of kin.

Mother's Maiden Name and Birthplace and Father's Name and Birthplace.—Enter name of mother and father and state of birth of each.

Miscellaneous.—Enter information suggested on the form or information directed by local authority.

Patient's Legal Residence—Enter home address of the patient, or name, address, and telephone of person to be notified in case of emergency.

Admission Diagnosis—Enter the diagnosis with which the patient is taken up on the sick list.

Discharge—Leave blank on admission.

To Where—Leave blank on admission.

Miscellaneous—Leave blank on admission, used to record sick days.

Date Sick List Began—Enter date admitted to the sick list under current continuous period.

"S" and "C"—If patient is placed on the serious or critical list on admission place an X in the appropriate block, otherwise leave blank.

Rate—Military personnel enter current rate abbreviation. Dependents enter "DEP"; "VAB"; "BEC"; etc.

Class/Branch—Enter USN, USNR, USA, USAF, USMC, USMCR, etc. Dependents enter abbreviation for service in which the patron is serving.

Service or VAB "C" Number and Ward—Enter service number for military personnel. Enter "C" number for VA beneficiaries. Enter ward to which assigned.

(d) **Distribution**—As shown on the form. Copy 6 may be directed to Chaplain, Red Cross, or as local policy directs.

2. Basic Chart

(a) **Clinical Record, History parts 1, 2, 3, and Physical Examination**; (SF 504, 505, and 506).

(1) **Preparation**—Enter patient's name, register number, and ward number. Admitting physician will make pertinent entries in the applicable sections prior to sending patient to the ward.

(2) **Disposition**—Send to ward with the patient.

(b) **Case Record Summary Sheet**—This is a local form and its makeup will vary. Enter patient's name, rate, service number, ward, admission diagnosis.

(1) **Disposition**—Sent to ward as part of basic chart.

3. Report of Examination for Evidence of Intoxication

(a) **Submission**—In all cases of suspected intoxication the Medical Officer of the Day must examine the patient and the report of examination must be prepared.

(b) **Format**—The form is locally prepared. However, it should contain a complete report of all examinations conducted including appearance, coherence, stability, and the result of any laboratory examination. The results of an examination for evidence of intoxication must be made in the log of the officer of the day at the time of the examination regardless of the opinion expressed in the report.

(c) Disposition—Forward to the record office to be made a part of the patient's clinical jacket.

4. Clinical Record Brief, Form PHS 484-1 (HD)

(a) Preparation—Detailed instructions for the preparation of this form are in a booklet issued by the PHS entitled "Complete Instructions, Clinical Record Brief, Form PHS 484."

(b) Submission—Original and two copies are completed through Block 37 and one copy is forwarded to the nearest United States Public Health Service office. That office will forward Treatment Authorization, Form PHS 894 (HD) to the admitting facility.

5. Application for Hospital Treatment or Domiciliary Care (VA Form 10-P-10).

(a) Preparation—The patient completes sections 1 through 32. All blocks are self-explanatory. In blocks in which no entry can be made, enter "None." A Notary Public must complete section 33. Patient completes sections 35 through 38. The admitting medical officer completes sections 39 through 51.

(b) Submission—Original and two copies are completed. Original and one copy are forwarded to the nearest Veterans Administration Regional Office accompanied by original or certified copy of discharge or release from last period of active duty.

D. Disposition of Patient and Records by the Admission Unit

1. Deliver to Patient:

(a) Patient's Identification Card (if prepared).

(b) Local instructions and directives, i. e., meal hours, religious services, movies, patient regulations, etc.

2. Deliver to Ward:

(a) Patient.

(b) Clinical Chart.

(c) #3 copy of Admission Record.

(d) Necessary personal effects for use on ward.

3. Deliver to Record Office:

(a) Original and #2 copy of Admission Record.

- (b) Admission authorization.
- (c) All official records and papers.
- (d) Change of Address Cards, NavPers 693.
- 4. Deliver to Bag Room:
 - (a) Patient's baggage (sealed with metal seal).
 - (b) Copy of Admission Record (local policy).

5. Additional Information:

(a) Dependents and Civilian Humanitarian nonindigent patients are required to make an advanced deposit of funds for hospitalization upon admission. The amount deposited is usually a sum sufficient to cover the cost of hospitalization for seven days. Funds are collected by the Collection Agent.

(b) When special problems are encountered which are not covered by regular admission authority, the admission unit personnel should consult the Record Officer during working hours, and the hospital officer of the day after working hours.

INSTRUCTION TEST

Assignment No. 25

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. One of the primary functions of the admission unit is to determine _____ of patients for admission.
2. It is vitally important for personnel of the admission unit to be thoroughly familiar with admission authority pertaining to each _____ of patients.
3. A great amount of difficulty may be caused by the admission in a naval hospital of _____ persons.
4. The commanding officer of a naval hospital may authorize the admission of any person for _____ reasons in an emergency.
5. Patients who identify themselves as eligible for hospitalization but do not present proper credentials may be admitted on the basis of their _____.
6. A written report should be made in all cases whenever persons apply for admission but are _____.
7. Provisions are usually made for the admission of _____ cases through a separate room or some other part of the hospital.
8. Enlisted patients are transferred to a naval hospital on a _____ order.

9. Credentials and records of enlisted personnel transferred to a naval hospital must include a ----- status letter.
10. Women personnel honorably discharged or separated from the service while pregnant are ----- for medical care during such pregnancy and confinement.
11. When active duty Navy and Marine Corps personnel apply for admission without orders or records, identification may be established by leave papers or ----- card.
12. Admission of active duty Army and Air Force personnel to an infirmary will be by a signed request of the member's -----
-----.
13. The pay records of retired naval officers (with-pay) and enlisted Fleet Naval Reserve or Retired, on inactive duty are carried by -----, BuSandA, Cleveland, Ohio.
14. Upon admission to a naval hospital, officers should be informed they will be required to pay ----- subsistence at the current rate payable at the end of each month or on -----.
15. Upon admission to a naval hospital, all official records and papers of the individual are forwarded to the ----- office.
16. Any reservist who is disabled while serving under orders to active duty for training is entitled to benefits only if the disability is caused by -----.
17. Any reservist who is disabled while serving under orders to active duty in excess of 30 days is entitled to benefits whether the cause of his disability is ----- or -----.
18. Reservists on inactive duty without pay do not rate hospitalization in a naval hospital and may be admitted only as ----- cases.
19. Beneficiaries of the naval home may be admitted to a naval hospital on written request of the ----- of the naval home.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

20. Upon admission to naval hospitals, officers are required to pay cash subsistence at the current rate, payable on discharge or
 1. at the end of each week
 2. at the end of each month
 3. at the end of each quarter
 4. at the end of each two weeks -----
21. When a Naval Reservist on active training duty contracts a disease he may receive treatment or hospitalization after discharge for a period of
 1. one week
 2. five weeks
 3. eight weeks
 4. ten weeks -----

22. Dependents of Coast Guard personnel are not eligible for hospitalization in a naval hospital except when
 1. the Coast Guard is operating as part of the navy
 2. no U. S. Public Health Service hospital is available
 3. prior approval of the commandant has been received
 4. on approval of the port director -----
23. Registrants of the Selective Service who are acting upon orders issued under the Selective Service Law may be admitted on request by
 1. the Public Information Officer
 2. the examining medical officer
 3. the local Selective Service Official
 4. the Medical Department representative of the examining center -----
24. An officer or employee of the Foreign Service of the State Department may be admitted to a naval hospital only on
 1. request by individual
 2. specific authority of the Bureau
 3. approval of the district medical officer
 4. approval of the commanding officer -----

INSTRUCTION TEST

Assignment No. 26

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. The Admission Record, NavMed 1285, is prepared by all naval hospitals, hospital ships, and ----- providing in-patient care.
2. The results of examinations for evidence of intoxication must be entered in the log of the ----- of the -----.
3. The report of intoxication is forwarded to the record office to be made a part of the patient's ----- jacket.
4. Upon admission, dependents are required to make an ----- deposit of funds for hospitalization, usually sufficient to cover the cost of hospitalization for a period of ----- days.
5. Funds for hospitalization of dependents are collected by the ----- Agent.
6. The Admission Record, NavMed 1285, is prepared on all admissions regardless of -----.

7. Members of North Atlantic Treaty Organization and Mutual Defense Assistance Program may be admitted to naval hospitals on request of their representative or of their officer.
8. When special problems are encountered which are not covered by regular admission authority, the admission unit personnel should consult the Office during working hours and the hospital of the after working hours.
9. A dependent husband and/or children of female personnel may be admitted to a naval hospital provided they are dependent for over their support.
10. Widows of deceased personnel are entitled to hospitalization benefits provided they have not
11. The term "parent" includes a step-parent who has stood in loco parentis to the person concerned for a continuous period of not less than years during the minority of such member.
12. On admission, the Case Record Summary Sheet will be forwarded to the with the patient as part of his basic chart.
13. Personnel who are permanently retired for a physical disability and who need hospital care for chronic arthritis, tuberculosis, psychiatric disorders, etc., will be hospitalized under the cognizance of the of Veterans Affairs.
14. For routine admission to naval hospitals, veterans will present VA Form 3-3542 (..... to), properly signed by the applicable Veterans Administration Regional Office or authorized representative.
15. Civil Service employees may be admitted to a naval hospital only when the disability is caused by, or is a result of injury or disease associated with their job.
16. Personnel on the Emergency Officers Retired List may be admitted to a naval hospital only as a beneficiary.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

17. The original and two copies of the Clinical Record Brief, PHS 484-1 (HD) will be completed through block 37, and one copy will be
 1. forwarded to BuPers
 2. forwarded to the nearest U. S. Public Health Service office
 3. forwarded to the commandant of the Coast Guard
 4. forwarded to BuMed

18. Section 33 of the Application for Hospital Treatment or Domiciliary Care (VA Form 10-P-10) must be completed by
1. the patient
 2. the commanding officer
 3. the personnel officer
 4. a Notary Public -----
19. Sections 39 through 51 of the Application for Hospital Treatment or Domiciliary Care (VA 10-P-10) must be completed by
1. the admitting medical officer
 2. the patient concerned
 3. the personnel officer
 4. a Notary Public -----
20. Sections 1 through 32 and 35 through 38 of the Application for Hospital Treatment or Domiciliary Care (VA 10-P-10) must be completed by
1. a Notary Public
 2. the personnel officer
 3. the patient concerned
 4. the commanding officer -----

SERVICE RECORDS

A. Officer

An Officer Service Record, NavPers 3021, shall be opened and maintained for each commissioned and Warrant Officer of the regular Navy and Naval Reserve on active duty, and each reserve officer attached to an organized reserve unit. The purpose of this record is to provide commanding officers with the information required to properly assign and administer those officers attached to their commands, and to provide each officer with a ready file for those documents required by him to establish facts relative to his naval service.

This record shall be filed in and maintained by the personnel office of the activity to which the officer is attached. When the officer is transferred, it is the joint responsibility of the officer concerned and his commanding officer to ascertain that the record is complete and contains all data pertaining to the tour of duty being completed.

When an officer is discharged from the naval service his service record is brought up to date and delivered to him.

If he is released from active duty his record is brought up to date and forwarded to the commandant of the naval district in which he intends to reside. If the officer is a member of an organized reserve unit his record is brought up to date and forwarded to the commanding officer of the applicable Reserve Training Center.

When an officer reports to a new duty station without a service record it is the responsibility of the commanding officer to obtain the missing service record.

Service records of officer personnel serving under temporary appointments in Warrant or commissioned grades will have their Enlisted Service Record, NavPers 601, kept up to date except that marks will not be assigned until such time that their appointments become permanent.

The service record of an officer shall be available for inspection by him or his duly authorized agent, designated by him in writing. The service record of an officer being considered for selection shall be available to the selection board for use in its deliberation.

Any matter that is rightfully placed in the service record of an officer may not be removed except by special authorization of the Secretary of the Navy.

Pursuant to United States Navy Regulations adverse matter may not be placed in an officer's service record without his knowledge. No anonymous communications will be made a part of an officer's service record.

The Officer Service Record, NavPers 3021, consists of a flat-type folder containing looseleaf pages. The right side of the service record is reserved for documents affecting utilization and assignment of the officer concerned. The left side of the service record is reserved for documents primarily relating to the present tour of duty of an officer.

Documents which are filed on the right side of the service record are:

1. Officer Qualifications Questionnaire, NavPers 309.

This form is completed in duplicate on each officer when he is commissioned. The original is forwarded to BuPers, the copy is filed as a permanent part of the service record.

Naval Reserve officers on inactive duty will use the

Annual Qualifications Questionnaire, NavPers 319. This form is sent to each Naval Reserve officer on inactive duty by the commandant of each naval district. The form is completed in triplicate and returned to the commandant. The original and one copy will be forwarded to BuPers; one copy is place in the officer's service record.

2. Report on the Fitness of Officers, NavPers 310.

Periodic reports are submitted semi-annually on all officers, including Midshipmen who are designated as naval aviators. The report on Ensigns, Warrant Officers, and Commissioned Warrant Officers is submitted for the period ending the last day of June and December. The report on Lieutenants Junior Grade and above is submitted for the period ending the last day of February and August.

The Annual Fitness Report for Naval Reserve Officers on Inactive Duty, NavPers 937, is submitted for the period ending 30 June of each year. When the reserve officer is on active duty the regular fitness report is used.

All periods from the time an officer is commissioned must be covered by a fitness report.

Fitness reports are submitted in all cases of permanent detachment of an officer or his reporting senior. To avoid brief reports the reporting senior need not submit separate reports for periods less than thirty days before or after the last regular reporting period.

Special or concurrent fitness reports are required:

- (a) When directed by higher authority.
- (b) When recommended for trial by a General Court-Martial.
- (c) When ordered to report to BuPers for disciplinary action.
- (d) When requesting detachment of an officer by the reporting senior.
- (e) When an officer distinguishes himself in battle or performs an outstanding act.

Fitness reports are mailed to BuPers in a double envelope. The inner envelope will be marked "Fitness Report, Private (Official) Communication." The outside

envelope will be addressed to Bureau of Naval Personnel (Officer Records Division).

3. Officer Biography Sheet, NavPers 979.

This form is prepared on initial appointment of an officer and whenever significant changes occur. The form is used to furnish publicity material for news releases on occasions such as promotion, public appearances, etc. The form is prepared in duplicate. The original is forwarded to BuPers, the copy is filed in the service record.

4. Training School Report, NavPers 318.

This report is normally used when an officer is initially commissioned to record special courses, tests, i. e., Officers Qualification Battery Tests. This form is not required for flag officers and Captains.

5. Officer Data Card, NavPers 340.

Submitted on 1 August annually for all commissioned and Warrant officers. The form will be completed on both sides except that officers of flag grades show only the last five years of service on the reverse of the card and Captains show only the last ten years of service. These cards are used to assist the detailing of officer personnel.

6. Annual Qualifications Questionnaire—Active Duty Officers (Form NavPers 549).

(a) This questionnaire is the means of obtaining for the preceding one year period all essential data concerning the skills, experience and training gained by individual naval officers on active duty. The data furnished on this form extends and keeps current the basic information contained in the Officer's Qualification Record maintained in the Bureau of Naval Personnel (articles B-2204 and B-2211).

(b) Officers of all grades on active duty shall submit this questionnaire annually on the 28th of February and upon detachment from duty station for release to inactive duty. It is stressed, however, that this questionnaire will be submitted by the individual officer direct to the Bureau of Naval Personnel rather than forwarding it via his or her commanding officer. Officers who are on leave, hospitalized, or in transit on 28 February will submit the form upon return to duty or upon reporting to their new duty station.

(c) The questionnaire shall be prepared in duplicate. The signed original shall be forwarded to the Chief of Naval Personnel and the copy filed in the Officer Service Record.

7. Statement of Personal History (DD Form 398).

8. The left side of the Officer Service Record, NavPers 3021, is reserved for information primarily relating to the officer's present tour of duty. The following documents should be filed here with the Officer's Leave Record, Form NavPers 329, on top:

(a) A copy of the Oath and Acceptance of Office for the officer's present grade.

(b) The original of any letters establishing Pay Entry Base Date received from BuPers.

(c) Record of Latest Emergency Data for the Armed Forces of the United States, DD-93.

(d) Certificates of Clearance for Handling Classified Matter, OpNav 32-429.

(e) Official correspondence relative to the tour of duty at his present duty station (on transfer, remove from record and give to the officer for his personal file).

(f) Copies of orders with all endorsements relating to the officer's tour at his present duty station (on detachment, remove from record and give to the officer for his personal file).

(f-1) Verification of Officer Service Records, NavPers 3076.

(g) Officer's Leave Record, NavPers 329.

(h) Home of Record Report Form for Naval Reserve Appointees.

(i) Statement of Submission of Agency Check request.

(j) Report of Separation from the Armed Forces of the United States (DD Form 214).

(k) Official correspondence relative to assignment to a Reserve Category and duty in the Naval Reserve program, such as requests for transfer to a pay unit, completion letters on correspondence courses, inactive status list letters, etc.

(1) Orders, or copies thereof, with all endorsements relative to assignment in the Naval Reserve program, such as associate nonpay orders issued by commandants or Chief

of Naval Air Reserve Training, Naval Reserve Transfer Notice (Form NavPers-998), and orders to active duty for training.

B. Enlisted

The Enlisted Service Record, NavPers 601, is the official history of an enlisted person's career while in the navy. It is the property of the government and not of the individual concerned. Entries therein shall be made only by those given such authority by the commanding officer. All entries therein shall be typewritten or printed with ink. Signatures shall be made with permanent black or blue-black ink only. The purpose of a signature is to show authority as represented by the person signing the entries.

Service records of all enlisted personnel shall be verified by all activities annually on 1 September and upon receipt or detachment. The verification shall ascertain that all required entries have been made properly; that duplicate pages, if indicated, have been removed; and that misfiled pages from other person's records are discovered and removed.

A notation shall be made in the space provided on the inside of the front cover showing the date, station, and the person verifying the record. This entry shall be initialed by the custodian or by the person who actually checked the record.

Should it be found that an error, such as an incorrect service number, name, or entry has been made in the service record the following action should be taken:

When the erroneous entry is discovered at the command where it was made and copies of the service record page *have not been* distributed; or if the erroneous entry is on a service record page a copy of which is not normally forwarded to the Chief of Naval Personnel or to the disbursing officer having custody of the service person's pay account (i. e., pages 3, 4, 5, 8, 9, 10 and 11), and the error is obvious by other authentic service record entries, the entry may be corrected by drawing a line, in black or blue-black ink,

through the erroneous entry. The commanding officer or other officer designated by the commanding officer shall enter his initials alongside the lined-out error, and the correct entry shall be made and signed or initialed as appropriate.

When an erroneous service record entry is discovered by the command making the error *after* copies of the service record page *have been* distributed (i. e., pages 6, 6A, 7, 12, 13 and 14), the erroneous page shall be removed from the service record and destroyed and a corrected service record page shall be prepared and conspicuously labeled "CORRECTED COPY." Copies of the corrected copy shall be forwarded to the Chief of Naval Personnel attached to a letter of transmittal which explains briefly the reason for the correction.

When an erroneous service record entry is discovered at a command other than where the erroneous entry was made and the error is not correctible under the instructions contained in *BuPers Manual*, Article B-2307(13), 4(a), the discrepancy shall be reported to the Chief of Naval Personnel by letter. This letter shall be sent via the command at which the error occurred, with an advanced copy to the Chief of Naval Personnel. The command at which the error occurred will endorse the letter to the Chief of Naval Personnel giving full details, recommended corrective action, and attach substantiating documents as appropriate.

A service record shall be opened and maintained for each person enlisted, reenlisted, or inducted into the United States Navy or its reserve components. When a service record is opened the name (surname, first name, middle name) and service number of the individual shall be typed or printed with ink in the space provided on the folder. For Naval Reserve personnel place a capital R after the letters USN.

Service records of enlisted personnel shall be closed out and forwarded via non-registered mail to the Bureau of Naval Personnel on account of death, desertion, discharge, retirement, transfer to the Fleet Reserve, and cancellation of enlistment.

The Enlisted Service Record, NavPers 601, consists of a flat-type folder containing looseleaf pages. Each enlisted service record will be composed of the following pages, as appropriate:

Page 1. Enlistment Contract, NavPers 601

This form is used for enlistment, reenlistment, or induction in the U. S. Navy or the U. S. Naval Reserve. Erasures and interlineations are prohibited. All signatures shall be made with black or blue-black ink. In all items where date entries are required use figures for days, abbreviation for the month, and figures for the year, i. e. 12 Feb 50. Race entries shall be limited to Caucasian, Negroid, Mongolian, Indian (American), and Malayan. The form will be prepared in triplicate; all pages will be signed. The signed copy will be placed in the service record. The original and the card will be forwarded to BuPers.

Page 1a. Agreement to Extend Enlistment, NavPers 604/NavSandA 513

This form is used to extend an enlistment for 1-2-3 or 4 years. All copies of the agreement must be signed by the individual and the officer taking his oath. Forward the fifth copy immediately to BuPers. Place the other four copies in the service record until the agreement becomes effective. An agreement becomes effective on the day following the date of expiration of enlistment unless cancelled prior to the effective date of the extension. Commanding officers are authorized to cancel agreements to extend enlistments under conditions as set forth in *BuPers Manual* Article C-1406 (9), (10).

Page 2. Record of Emergency Data for the Armed Forces, DD 93

This form is designed to provide an adequate record for emergency data pertaining to the following:

- (a) Person to be notified in case of emergency.

- (b) Person to receive six months death gratuity.
- (c) Person (including commercial insurance companies or banks) to receive special class allotments and the sum to be so received, in the event that the service person becomes missing, missing in action, beleaguered, besieged, interned in a neutral country, or is otherwise prevented from returning to naval jurisdiction.
- (d) Person to receive servicemen's indemnity if order named in law, namely, surviving spouse, child or children, parents, or brother(s) or sister(s), is not satisfactory.

The form will be prepared in duplicate on entry into the service and whenever a major change occurs such as change of permanent address, marriage, divorce, reenlistment, or promotion to officer rank. Each of the two completed copies is to be signed by the person executing the form. The signed original shall be forwarded to the Bureau of Naval Personnel; the signed copy shall be maintained at the duty station and filed in the service record. Whenever a new DD Form 93 is prepared for any individual, the old form maintained at his duty station will be destroyed.

Page 3. Enlisted Classification Record, NavPers 601

This form is used to record information relative to a person's basic test scores, civilian education and training, personal interest, and civilian experience in work fields. The form is prepared in duplicate only at activities which have a classification service. The original is placed in the service record and the copy forwarded to BuPers. On reenlistment the original is transferred to the new service record. If the individual does not reenlist immediately the form is securely stapled to his discharge certificate.

Page 4. Navy Occupation and Training History, NavPers 601

This form is used as a complement to the Enlisted Classification Record by providing a chronological record of

education, advancement or reduction in rating, and changes in the Navy Job Code of an individual. The form will be prepared in duplicate. Both the original and the duplicate are placed in the current service record. Upon reenlistment transfer the original to the new service record. Forward the duplicate with the old service record. Prepare a new original and duplicate and place both in the new service record. In this manner there will be an original page 4 in the current service record for each enlistment. If the individual does not immediately reenlist staple the original of this form to his discharge certificate.

Page 5. Gunnery Record, NavPers 601

This form will be prepared in the case of an individual qualifying in the use of small arms or qualifying for a key gunnery station. Gunnery records shall be kept up to date and data entered as events occur. The original only shall be prepared and kept in the current service record. Upon reenlistment transfer the gunnery record to the new service record.

Page 6. Court Memorandum, NavPers 601/NavSandA 518

This form serves as a transcript of a court-martial and as an order to the disbursing officer to effect an adjustment in the pay record of the individual concerned. This form will be prepared for each summary, special, or general court-martial resulting in an approved conviction, or for a captain's mast if it results in a reduction in rating. The form will be prepared showing the following data:

- (a) The date of mast.
- (b) The type of court-martial.
- (c) The date of trial.
- (d) Synopsis of offense(s) and date(s).
- (e) The sentence as approved by convening authority.
- (f) Date and other identification of Convening Authority's Action. The original and all copies of page 6 must be signed. The original (part 1) will be placed in the

service record. Parts 2 and 3 will be delivered to the disbursing officer having custody of individual's pay record. Part 4 will be forwarded to the Bureau of Naval Personnel.

Page 6a. Supplementary Court Memorandum, Nav-SandA 518

This form is prepared to indicate the result of further review after action by the convening authority, remitting or suspending action under Article 74, UCMJ, and action under Article 15 (d), UCMJ, if such action modifies a court memorandum. The form will be prepared in quadruplicate; all pages must be signed. The original is placed in the service record, parts 2 and 3 are forwarded to the disbursing officer, and part 4 is forwarded to BuPers.

Page 7. Individual Order to Adjust Pay Record, Nav-SandA 515

This form is used to record certain data in the service record of an individual, and as an order to the disbursing officer to adjust the pay record of an individual. The form has space for eight items; only one item of this page shall be completed on any one page except that, when a person is granted both subsistence and quarters allowances concurrently, items 5 and 6 may be completed on the same page. The form is prepared in quadruplicate; all pages must be signed. The original will be placed in the service record; parts 2 and 3 delivered to the disbursing officer, part 4 is forwarded to BuPers.

Page 8. Leave Record, NavPers 601

The leave record is used to record leave taken and the balance of leave remaining. A leave record will be maintained for each enlisted person on active duty. An original only of the leave record is prepared and will be kept current in the service record until separation or reenlistment. A leave entry in the "Credit" column will be made only on 30

June of each year or whenever an individual deserts, dies, or is separated from the service. Each entry on the leave record must be dated and signed by a designated officer. Types of leave to be entered are:

- (a) A—Annual
- (b) R—Reenlistment
- (c) E—Emergency
- (d) RT—Recruit

A new leave record will be opened on reenlistment.

Page 9. Marks, NavPers 601

The record of marks assigned must be maintained for every enlisted person on active duty. Only the original is required and is kept current in the service record. Marks shall be assigned and entered as the reasons for their assignment occur. In the column headed "Reason" the following abbreviations shall be used:

- (a) P—Quarterly, at the end of March, June, September, and December, and upon closing out the service record by reason of discharge, death, or other separation covering the period from the last quarterly marks assigned.
- (b) T—Upon transfer from one ship or station to another.
- (c) D—Discipline, as a result of offense(s) for which punishment is awarded.

Each entry on the marks page must be dated and initialed. This page is kept in the service record and forwarded to BuPers on separation and reenlistment.

Page 11. Record of Naval Reserve Service for Enlisted Personnel, NavPers 601

This form provides an accurate and up-to-date means of recording retirement points earned by Naval Reserve enlisted personnel under Public Law 810, 80th Congress. It replaces Page 10, Record of Training Duty and Page 11, Drill Attendance Record, both of which are retained in the

service record, but on which no new entries are made. New entries are made on the current Page 11. Both original and duplicate of this page are retained in the service record during each current enlistment of a reservist. Upon his separation, forward the completed original and duplicate to BuPers with the closed out service record, unless he immediately reenlists, in which case send the original with the closed out service record to BuPers and retain the completed duplicate in the new service record.

Page 12. Desertion, NavPers 601/NavSandA 514

This form is designed to combine on one page the desertion entry and an order to the disbursing officer to transfer the pay record of the individual concerned to the Deserter's Roll. It also shows an accounting of the sale of deserter's effects, and provides for the removal of the mark of desertion when appropriate. The form will be prepared in quadruplicate; all pages must be signed. Two copies will be forwarded to the disbursing officer carrying the individual's account. The original and one copy will be placed in the service record and the service record will be immediately forwarded to BuPers.

Page 13. Administrative Remarks, NavPers 601

The administrative remarks portion of this form shall be used for all miscellaneous entries which are not recorded elsewhere in the service record, or when more detailed information may be required to clarify entries on other pages. When an individual is received at his ultimate destination in compliance with orders, complete the receipt portion and forward the copy to BuPers. No further entries shall be made on the original. Prepare a new form in duplicate and place in the service record. When this form has been filled with administrative entries forward the copy to BuPers. No further entries shall be made on the original. Upon separation or reenlistment forward the originals to BuPers with the closed-out service record.

Page 14. Record of Discharge, Release From Active Duty, or Death NavPers 601/NavSandA 512

This form shall be used in every case of discharge, death, retirement, transfer to the Fleet Reserve, or release from active duty. In each case the form must be completed showing the disposition, enlistment data, and disbursing data. The original and two copies shall be prepared. The original will be placed in the closed-out service record; two copies will be sent to the disbursing officer carrying the individual's account.

Page 15. Report of Separation From the Armed Forces of the United States, DD-214

(1) This report shall be prepared and issued to all personnel at the time of separation from active service. This form shall also be issued to enlisted personnel discharged while on active duty for the purpose of:

- (a) immediately enlisting.
- (b) reenlisting.
- (c) accepting *permanent* appointment to either warrant or commissioned status for continued active duty.

(2) This form shall not be issued in the case of personnel who:

- (a) are found physically disqualified for active duty upon *first* reporting therefor.
- (b) are separated from active duty by reason of death.
- (c) are separated from active duty for training.
- (d) in the case of officers, are transferred to another component or to another branch of the Armed Forces and the transfer is effected concurrently and without interruption of active duty status.

(3) Entries on the DD Form 214 shall be typewritten. Care shall be exercised in its preparation to insure that all copies are legible and that the information contained therein is accurate and complete.

(4) The form must be signed by the individual concerned and a designated officer. The form must be signed with an

indelible pencil. See the prevailing Bureau of Naval Personnel directives for detailed instructions concerning preparation and distribution of the form.

INSTRUCTION TEST

Assignment No. 27

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. An Officer Service Record, NavPers 3021, will be opened on every officer of the regular Navy, Naval Reserve on duty, and each reserve officer attached to an reserve unit.
2. The officer service record will provide commanding officers with the information to properly and administer attached officers.
3. When an officer is discharged from the naval service his record is brought up to date and delivered to
4. When an officer is released from active duty to inactive duty his record is brought up to date and forwarded to the of the in which he intends to reside.
5. The enlisted service record of a temporary officer is kept up to date except that are not assigned.
6. The service record of an officer being considered for selection is available to the for its deliberation.
7. The right side of an officer's service record is reserved for documents affecting and
8. The left side of an officer's service record is reserved for documents relating to his tour of duty.
9. Adverse matter may not be made a part of an officer's service record without his
10. The Officer Fitness Report, NavPers 310, is submitted on Ensigns, Warrant and Commissioned Warrant Officers as of the last day of and
11. The Officer Fitness Report, NavPers 310, is submitted on Lieutenants Junior Grade and above as of the last day of and
12. Communications of an nature will not be made a part of an officer's service record.
13. The Annual Qualifications Questionnaire for Naval Reserve Officers on Inactive Duty, NavPers 319, is completed by the officer and returned to the
14. The report on the Fitness of Officers, NavPers 310, will be made on Midshipmen who are designated as naval

15. A Fitness Report is submitted in all cases of permanent detachment of an officer or his -----
16. The Officer Data Card, NavPers 340, is submitted annually as of 1 ----- for commissioned officers and warrant officers.
17. The Officer Data Card, NavPers 340, will be completed on both sides except that officers of flag grade will show only the last ----- years of service on the reverse.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the space provided.

18. Any matter that is rightfully placed in an officer's service record may not be removed except by special authorization of the
 1. Personnel Officer
 2. Secretary of the Navy
 3. Bureau of Naval Personnel
 4. Commanding Officer -----
19. The form used to furnish publicity material for news releases on promotions, public appearances, etc., is the
 1. Training School Report, NavPers 318
 2. Officer Biography Sheet, NavPers 979
 3. Officer Data Card, NavPers 340
 4. Record of Duties Performed, NavPers 3031 -----
20. The Officer Service Record, NavPers 3021, will be filed in the
 1. office of the commanding officer
 2. office of the executive officer
 3. office of the administrative assistant
 4. office of the personnel office -----
21. The Officer Qualifications Questionnaire, NavPers 309, will be completed in the
 1. original only
 2. original and three copies
 3. original and one copy
 4. original and two copies -----

INSTRUCTION TEST

Assignment No. 28

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. The Enlisted Service Record, NavPers 601, is the property of the -----

2. Entries are made in the enlisted service record only by those who are given authority by the ----- officer.
3. All entries in the enlisted service record will be typewritten or -----.
4. Signatures shall be made only with permanent blue-black or ----- ink.
5. Periodic verifications of all enlisted service records will be made annually on 1 -----, and upon receipt and detachments.
6. Periodic verification entries will be initialed by the ----- or the person who actually checked the record.
7. Any discrepancy found in the enlisted service record can be corrected without notifying BuPers if the error is made at the ----- command.
8. When an error is found in an enlisted service record it may be lined out with ----- or ----- ink. The designated officer will initial the error and the ----- entry will be made and signed or initialed as appropriate.
9. Erasures, interlineations, and ditto marks in a service record are -----.
10. BuPers must be notified of a corrected error if the error was made by a ----- command.
11. A service record will be opened and maintained for each person enlisted, reenlisted, or inducted in the Navy or its ----- components.
12. Whenever a service record is closed out it is forwarded to the Chief of -----.
13. All signatures on the enlistment contract will be made with ----- or ----- ink.
14. Race entries on the enlistment contract will be limited to Caucasian, Negroid, Mongolian, Indian (American), and -----.
15. After the Agreement to Extend Enlistment has been signed, but prior to becoming effective, the ----- copy is forwarded to BuPers.
16. The Agreement to Extend Enlistment becomes effective on the day ----- the expiration of enlistment.
17. An Agreement to Extent Enlistment may be cancelled ----- to the effective date of execution of the agreement.
18. The Record of Emergency Data for the Armed Forces of the United States, DD 93, is prepared for each person upon ----- into the service or whenever a major change occurs.
19. The Record of Emergency Data for the Armed Forces of the United States, DD 93, is designed, in addition to several other purposes, to record the person to receive special class -----, and the sum to be received in the event that the service person becomes missing, missing in action, interned in a ----- country, or is otherwise prevented from returning to naval jurisdiction.

20. The Enlisted Classification Record, NavPers 601, is prepared only at activities which have a ----- service.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

21. In all spaces on the enlistment contract where the date appears it will be written as
1. 12 February 1950
2. 12 Feb 1950
3. 12 Feb 50
4. 12 February 50 -----
22. The signed original of the enlistment contract is
1. placed in the service record
2. forwarded to BuPers
3. forwarded to District Medical Officer
4. placed in the file -----
23. The Record of Emergency Data for the Armed Forces of the United States, DD 93, is prepared in
1. original only
2. duplicate
3. triplicate
4. quadruplicate -----
24. The original of the Record of Emergency Data for the Armed Forces of the United States will be
1. forwarded to BuPers
2. filed in the service record
3. forwarded to the SecNav
4. forwarded to the commandant -----
25. Upon reenlistement, the original of the Enlisted Classification Record is
1. forwarded to BuPers
2. transferred to the new service record
3. forwarded to the commandant
4. destroyed and a new form prepared -----

INSTRUCTION TEST

Assignment No. 29

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. A Court Memorandum will be prepared for each summary, special, or general court-martial resulting in an approved -----.
2. The original and all copies of the court memorandum must be -----.
3. The Supplementary Court Memorandum is used to indicate the result of further review after action by the convening authority if the action modifies a ----- memorandum.
4. The original and all copies of the Individual Order to Adjust Pay Record must be properly -----.
5. A Leave Record must be maintained for each enlisted person on ----- duty.
6. The Leave Record is kept current in the service record until separation or -----.
7. A leave entry will be made in the "Credit" column of a leave record on 30 ----- of each year; or on death, desertion, or separation from the service.
8. Each entry on the leave record must be dated and ----- by a designated officer.
9. Marks on enlisted personnel will be assigned -----, upon -----, as a result of offense(s) for which ----- is awarded, and on discharge or whenever the service record is closed out for any reason.
10. One use of the report of Desertion, NavSandA 514, is to transfer the ----- of a deserter to the Deserter's Roll.
11. The report of Desertion, NavSandA 514, is prepared in -----.
12. The administrative remarks page is used for ----- entries which are not recorded elsewhere in the service record or whenever more detailed information may be required for ----- of entries on other pages. It also serves as a record of ----- and -----.
13. All signatures on the Report of Separation from the Armed Forces of the United States, DD-214, must be made with an -----.
14. The record of receipt and transfer at the bottom of the administrative remarks page must be completed on receipt of an individual and the ----- forwarded to BuPers.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

15. Information relative to establishing the identity of the person to receive the six months death gratuity is contained on the following page of the enlisted service record
1. the Enlisted Classification Record
 2. the Enlistment Contract
 3. the Record of Emergency Data for the Armed Forces
 4. the Individual Order to Adjust Pay Record -----
16. Whenever an individual is separated from the service, his Enlisted Classification Record will be
1. left in his closed-out service record
 2. destroyed
 3. forwarded to the nearest Veterans Administration Regional Office
 4. stapled to his discharge certificate -----
17. The Gunnery Record, NavPers 601, is prepared in
1. the original only
 2. the original and one copy
 3. the original and two copies
 4. the original and three copies -----
18. Upon reenlistment, the original of the Navy Occupation and Training History is
1. forwarded with the closed-out service record
 2. stapled to his Report of Separation
 3. transferred to his new service record
 4. destroyed -----
19. The Court Memorandum, NavPers 601/NavSandA 518 is used for a case appearing at captain's mast if it results in
1. detention of pay
 2. a reduction in rating
 3. extra duty
 4. restriction -----
20. Upon reenlistment, the Gunnery Record is
1. forwarded with the closed-out service record
 2. transferred to the new service record
 3. given to the individual
 4. destroyed -----

21. The original of the Court Memorandum, NavPers 601/NavSandA 518 is
1. forwarded to BuPers
 2. forwarded to the disbursing officer
 3. placed in the service record
 4. forwarded to the convening authority -----
22. The original of the Individual Order to Adjust Pay Record, NavPers 601/NavSandA 515, is
1. forwarded to BuPers
 2. forwarded to disbursing officer
 3. placed in the service record
 4. forwarded to records retirement center -----
23. Which of the following types of leave will not be entered on the leave record?
1. Annual leave
 2. Recruit leave
 3. Sick leave
 4. Reenlistment leave -----
24. The original and one copy of the Report of Desertion, NavPers 601/NavSandA 514, are
1. forwarded to the commandant
 2. forwarded to SecNav
 3. forwarded to the disbursing office
 4. placed in the service record -----

Reenlistment Procedure and Records

Commanding officers should carefully consider the background, performance of duty, and capabilities of personnel before recommending them for enlistment or reenlistment in the Regular Navy. Ability to perform the broad duties of the general service rating should be especially considered.

Procedure for Discharge and Immediate Reenlistment.

1. Just prior to the date of discharge send the individual to a Medical Officer for a physical examination, X-ray of the chest, blood Kahn, etc.
2. Prepare a new service record cover.
3. Page 1, Enlistment Contract
 - (a) Complete the form. All signatures will be made with black or blue-black ink.

- (b) Attach the original and the card (Part 2 of the enlistment contract) to the outside cover of the old service record.
 - (c) Place the signed copy in the new service record.
- 4. Page 2, Record of Emergency Data for the Armed Forces, DD 93
 - (a) Prepare an original and one copy.
 - (b) Place a copy in the new service record.
 - (c) Forward the original to BuPers.
 - (d) Destroy the DD 93 in the old service record.
- 5. Page 3, Classification Record
 - (a) Transfer the classification record from the old service record to the new service record.
- 6. Page 4, Navy Occupation and Training History
 - (a) Prepare an original and one copy.
 - (b) Place both pages in the new service record.
 - (c) Transfer the original of the old page 4 and all originals of old page 4's from previous enlistments from the old service record to the new service record.
 - (d) Forward the old copy to BuPers with the old service record.
- 7. Page 5, Gunnery Record
 - (a) Transfer the gunnery record from the old service record to the new service record.
 - (b) A new gunnery record will not be prepared.
- 8. Page 6, Court Memorandum
 - (a) Leave this page in the old service record and forward therewith to BuPers.
- 9. Page 6a, Supplemental Court Memorandum
 - (a) Leave this page in the old service record and forward therewith to BuPers.
- 10. Page 7, Individual Order to Adjust Pay Record
 - (a) This page will be prepared only in case the individual applies for commuted rations. If he does not apply for commuted rations, (b), (c), and (d) listed below do not apply.
 - (b) Forward pages 2 and 3 to the disbursing officer.
 - (c) Forward page 4 to BuPers.
 - (d) Place the original in the new service record.

11. Page 8, Leave Record

- (a) Terminate the old leave record.
- (b) Forward to the disbursing officer for signature and verification.
- (c) Replace in the old service record.
- (d) Prepare a new leave record, original only.
- (e) Forward to the disbursing officer if the individual elects cash settlement for unused leave.
- (f) Place new leave record in the new service record.

12. Page 9, Marks

- (a) Compute a final average mark using only the marks that have been assigned quarterly.
- (b) Enter the final average on the old marks page.
- (c) Forward to BuPers with the old service record.
- (d) Prepare a new marks page.
- (e) Place in the new service record.

13. Pages 10, 11, Record of Training Duty, Drill Attendance Record

- (a) These pages may be found in the service records of some Naval Reserve personnel only.
- (b) A new Page 11 replaces *both* of these pages.
- (c) These pages will be retained in the service record, but no new entries will be made.

14. Page 11, Record of Naval Reserve Service for Enlisted Personnel

- (a) This page will be found in the service record of Naval Reserve personnel only.
- (b) The original of this page will be forwarded with the old service record.
- (c) The completed duplicate will be retained in the new service record.

15. Page 13, Administrative Remarks

- (a) Copy all discharge data on the original and one copy of the old administrative remarks page.
- (b) Place in the old service record.
- (c) Prepare an original and one copy of a new administrative remarks page.
- (d) Enter all reenlistment data on the new administrative remarks page, i. e., date of last advancement in

rating, all marks since the last advancement in rating; date sea or shore duty began and sea duty since last change in rating. Enter amount of reenlistment bonus paid. Enter the number of days leave for which a cash settlement is made and the amount of the cash settlement.

(e) Place the original and copy in the new service record.

16. Page 14, Record of Discharge, Release from Active Duty, or Death

(a) Prepare an original and two copies.

(b) Place the original in the old service record.

(c) Forward the two copies to the disbursing officer.

17. Page 15, Report of Separation from the Armed Forces

(a) Prepare a report of separation in accordance with current instructions.

(b) A designated officer and the individual concerned must sign the form. The signatures must be made with an indelible pencil.

(c) Give the original to the individual.

(d) Place the number 2 copy in the old service record.

(e) Place the number 7 copy in the new service record on the left side.

(f) Distribute the other copies as shown on the form.

18. Loyalty Report, DD 98 and 98a

(a) Complete and have the form signed by the individual and an officer.

(b) The oath of allegiance on the enlistment contract shall not be administered until the loyalty report has been completed and signed.

(c) Place in the old service record.

19. Recruiting File Record, NavMed Xa

(a) Prepare and place in the file.

(b) If a waiver has been requested, the action shall be noted after the cause for rejection on the form.

20. Order to Enter Account, NavSandA 511

(a) Prepare the original and one copy.

(b) Send both copies to the disbursing officer.

21. Personnel Diary, NavPers 501

(a) Upon discharge, make a loss change entry.

- (b) Upon reenlistment, make a gain change entry.
- 22. Personnel Accounting Card, NavPers 500
 - (a) Upon reenlistment, prepare the card in quadruplicate.
 - (b) Place the original in the muster file.
 - (c) Forward card number 2 to the local PAMI (Personnel Accounting Machine Installation).
 - (d) Cards number 3 and 4 will be used according to local policy.
- 23. Discharge Certificate
 - (a) Enter the type of discharge on the reverse of the form using the applicable article number in the *Bureau of Naval Personnel Manual*. Do not use the descriptive words to describe the type of discharge.
 - (b) If the individual has received a letter of commendation or a higher award, enter on the reverse in abbreviated form.
 - (c) Do not make an entry on the reverse regarding any recommendation for reenlistment.
 - (d) In the cases of Chief Petty Officers and Chief Stewards, enter on the reverse whether appointment is acting or permanent.
 - (e) Enter other information as required on the reverse, i. e. date and place of birth, ship or station, rate, service number, etc.
- 24. Certificate of Service, DD-217-N
 - (a) The primary purpose of this form is to provide personnel who have served honorably on active duty with a wallet-size certificate of such service.
 - (b) The secondary purpose of this form is for identification.
- 25. Uniform Code of Military Justice, Article 137
 - (a) Article 137 of the Uniform Code of Military Justice is quoted in part herewith:
 - “Articles 2, 3, 7 through 15, 25, 27, 31, 37, 38, 55, 77 through 134, and 137 through 139 of this code shall be carefully explained to each enlisted

person at the time of his entrance on active duty in any of the Armed Forces of the United States, or within six days thereafter. They shall be explained again after he has completed six months of active duty, and again at the time he reenlists."

- (b) Make an entry on the new administrative remarks page that these articles have been explained to the individual.

26. Identification Card, DD-2N (Active)

- (a) Destroy the old identification card.
- (b) Prepare a new identification card.

27. Report of Medical Examination, Standard Form 88

- (a) Prepare an original and two copies.
- (b) Have all copies signed by the medical and dental officer.
- (c) Terminate the old SF-88 or the old NavMed H-2 as appropriate.
- (d) Place a signed copy of the SF-88 in the Health Record.
- (e) Terminate the old Standard Form 600, Chronological Record of Medical Care and NavMed H-8's as appropriate.
- (f) Staple to the original and one copy of the new SF-88 and forward to BuMed.
- (g) In the event a waiver for a physical disability is required, the report will be made on a Standard Form 88 and forwarded to the Chief of Naval Personnel via Chief of the Bureau of Medicine and Surgery with a Report of Rejection, NavPers 684 serving as a letter of transmittal. When it is necessary to submit a recommendation for waiver of a physical disability by dispatch, it will be addressed to the Chief of the Bureau of Naval Personnel with the Chief of the Bureau of Medicine and Surgery as an information addressee. When the action on the recommendation for a waiver has been received, the result must be entered on the service record, health record, and the Recruiting File Record, NavMed Xa.

28. Give the following items to the individual:
- (a) Report of Separation, DD-214 (Original)
 - (b) Discharge Certificate
 - (c) Honorable Discharge Button
 - (d) Certificate of Service, DD-217-N
 - (e) Identification Card, DD-2N (Active)
29. Service Record, NavPers 601
- (a) Forward the old service record to BuPers with the original and card (Part 2) of the enlistment contract attached to the outside cover of the old service record.
 - (b) A letter of transmittal to the Chief of Naval Personnel, for the attention of the Tabulated Records Branch, shall accompany enlisted service records which shall be forwarded on the day following the date of actual separation.
 - (c) These letters shall be numbered serially, in chronological order, and shall indicate the total number of records enclosed.

INSTRUCTION TEST

Assignment No. 30

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. Upon reenlistment, the original and card (Part 2) of the enlistment contract will be attached to the _____ cover of the old service record and forwarded to BuPers.
2. Upon reenlistment, the original and _____ copy(ies) of the record of emergency data will be prepared.
3. Upon reenlistment, a new original and _____ copy(ies) of the Navy Occupation and Training History will be prepared.
4. There will be an original of the Navy Occupation and Training History in the service record for each _____.
5. Upon reenlistment, a final _____ of all periodic marks will be computed.
6. A record of training duty will be found in the service records of Naval _____ personnel only.

7. Upon reenlistment, the old leave record will be forwarded to the disbursing officer for signature and -----.
8. Upon reenlistment, the final average marks are computed using only marks that have been assigned -----.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

9. Upon reenlistment, all signatures on the enlistment contract must be made with
 1. an indelible pencil
 2. red ink
 3. blue ink
 4. black or blue-black ink -----
10. Upon reenlistment, the record of emergency data in the old service record will be
 1. left in the old service record
 2. destroyed
 3. transferred to the new service record
 4. forwarded to BuSandA -----
11. Upon reenlistment, the signed copy of the new enlistment contract will be
 1. placed in the new service record
 2. placed in the old service record
 3. forwarded to BuPers
 4. given to the individual -----
12. Upon reenlistment, the original of the new record of emergency data will be
 1. placed in the new service record
 2. given to the individual
 3. placed in the old service record
 4. forwarded to BuPers -----
13. Upon reenlistment, the classification record in the old service record will be
 1. given to the individual
 2. left in the old service record
 3. transferred to the new service record
 4. destroyed -----
14. Upon reenlistment, the old original Navy Occupation and Training History will be
 1. left in the old service record
 2. transferred to the new service record
 3. destroyed
 4. given to the individual -----

15. Upon reenlistment, the court memorandum pages in the old service record will be
1. destroyed
 2. given to the individual
 3. transferred to the new service record
 4. left in the old service record -----
16. Upon reenlistment, the leave record in the old service record will be terminated and
1. transferred to the new service record
 2. forwarded to BuSandA
 3. forwarded to BuPers with the old service record
 4. forwarded to the supply officer for verification -----
17. Upon reenlistment, the gunnery record in the old service record will be
1. transferred to the new service record
 2. terminated and forwarded with the old service record
 3. destroyed and a new gunnery record prepared
 4. given to the individual -----
18. Upon reenlistment, if an individual applies for commuted rations, an Individual Order to Adjust Pay Record will be prepared and pages 2 and 3 will be
1. forwarded to the supply officer
 2. forwarded to the disbursing officer
 3. forwarded to BuPers
 4. placed in the new service record -----
19. Upon reenlistment, the original and card (Part 2) of the enlistment contract will be
1. placed in the new service record
 2. placed in the old service record
 3. sent to the disbursing officer
 4. attached to the outside cover of the old service record and forwarded to BuPers -----
20. Upon reenlistment the signed copy of the new enlistment contract, will be
1. placed in the file to prepare annual reports
 2. placed in the old service record
 3. placed in the new service record
 4. forwarded to BuPers -----

MATCHING ITEMS

To the right of each phrase or symbol in list B write the number of the one most closely related item in list A.

21. Match the following page numbers of the service record with the appropriate name of the form.

A	B	
1. Page 3	Gunnery Record	-----
2. Page 5	Classification Record	-----
3. Page 8	Report of Separation	-----
4. Page 9	Marks	-----
5. Page 12	Leave Record	-----
6. Page 13	Administrative Remarks	-----
7. Page 15		

INSTRUCTION TEST

Assignment No. 31

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. Upon discharge, in the case of a Chief Petty Officer, an entry shall be made on the reverse of the discharge certificate as to whether his appointment is ----- or -----.
2. Upon discharge, no entry is required on the reverse of the discharge certificate regarding recommendation for -----.
3. The primary purpose of the certificate of service is to provide personnel who have served ----- on active duty with a ----- size certificate of such service.
4. The secondary purpose of the certificate of service is for -----.
5. When service records are forwarded to BuPers with letters of -----, the letters will be numbered serially and in ----- order.
6. Article 137 of the Uniform Code of Military Justice must be explained to each enlisted person at the time of his entrance on ----- or within ----- days thereafter and upon -----.
7. Upon reenlistment, if an individual elects a cash settlement for ----- leave, the old leave record should be forwarded to the ----- officer.

8. After Article 137 of the Uniform Code of Military Justice has been explained, an entry should be made on the ----- page of the service record.
9. Upon discharge, certain information must be typed on the reverse of the ----- If a letter of commendation or higher award has been received enter on the reverse in ----- form.
10. When it is necessary to submit a recommendation for a waiver for a physical disability by dispatch, it will be addressed to BuPers, with BuMed as an ----- addressee.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

11. A record of Naval Reserve service will be found in the
 1. service records of personnel of the regular Navy
 2. service records of personnel of the Naval Reserve
 3. service records of both regular and reserve personnel
 4. service records of neither regular nor reserve personnel-----
12. Upon reenlistment, the original of the report of separation will be
 1. placed in the old service record
 2. placed in the new service record
 3. forwarded to the nearest Veterans Administration Regional Office
 4. given to the individual-----
13. Upon reenlistment, the order to enter account will be prepared in
 1. original only
 2. duplicate
 3. triplicate
 4. quadruplicate-----
14. Upon reenlistment, the number 7 copy of the report of separation will be
 1. placed in the old service record
 2. forwarded to BuSandA
 3. placed in the new service record
 4. given to the individual-----
15. Upon reenlistment, the loyalty report shall be signed by
 1. the individual and an officer
 2. the individual only
 3. the officer only
 4. the commanding officer-----

- 16. Article 137 of the Uniform Code of Military Justice must be explained to each enlisted person at the time of his entrance on active duty or within six days thereafter and again after he has completed**
1. three months of active duty
 2. six months of active duty
 3. nine months of active duty
 4. twelve months of active duty -----
- 17. Upon recommendation for a waiver of a physical disability, final approval of the waiver rests with**
1. BuMed
 2. the commanding officer
 3. BuSandA
 4. BuPers -----
- 18. Upon reenlistment, the number 2 copy of the report of separation will be**
1. placed in the old service record
 2. given to the individual
 3. forwarded to the nearest Veterans Administration Regional Office
 4. placed in the new service record -----
- 19. Upon reenlistment, all copies of the order to enter account will be**
1. forwarded to BuSandA
 2. placed in the new service record
 3. placed in the old service record
 4. forwarded to the disbursing officer -----
- 20. Upon reenlistment of an individual, his old service record will be**
1. forwarded to the records retirement center
 2. retained in the files of the activity
 3. forwarded to BuPers
 4. forwarded to BuPers via BuMed -----
- 21. In the event a waiver is recommended and requested, the report will be made on a Standard Form 88 and forwarded to**
1. BuPers via BuMed for approval
 2. BuPers only
 3. BuMed only
 4. the commanding officer for approval -----
- 22. When it is necessary to submit a recommendation for a waiver of a physical disability, the report will be made on a Standard Form 88 and forwarded to BuPers with a report of rejection serving as**
1. an amplifying report
 2. a letter of transmittal
 3. an endorsement
 4. a report of disqualification -----

23. The Standard Form 88 in the new health record takes the place of the old
1. NavMed H-2
 2. NavMed H-3
 3. NavMed H-5
 4. NavMed H-8
-
24. The oath of allegiance shall not be administered on the enlistment contract until
1. the fingerprint record has been made
 2. a NavPers 500 card has been made
 3. the loyalty report has been completed and signed
 4. the NavMed Xa has been prepared
-

MATCHING ITEMS

To the right of each phrase or symbol in list B write the number of the one most closely related item in list A.

25. Match the following forms with their descriptive names.

A	B	
1. Order to Enter Account	DD 217-N	-----
2. Report of Rejection	NavPers 684	-----
3. Discharge Certificate	DD 2 N (Active)	-----
4. Loyalty Report	NavSandA 511	-----
5. Certificate of Service	DD 98 and 98a	-----
6. Identification Card		

Death Procedures

Read chapter 17 of the *Manual of the Medical Corps* and sections of the *Bureau of Naval Personnel Manual*, NavPers 15791, pertaining to death procedures.

INSTRUCTION TEST

Assignment No. 32

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. When a death occurs at a naval activity or in a naval vessel, a report shall be made to the Secretary of the Navy by means of a
-----.

2. When death of a merchant seaman occurs at a naval activity within the continental United States, the nearest representative of the U. S. ----- shall be contacted for necessary instructions.
3. In the event of the death of a merchant seaman at a naval activity beyond the continental limits of the United States, the nearest ----- shall be notified and requested to issue the necessary instructions for the preparation and disposition of the remains.
4. On the "From" line of the NavMed-N, do not use such expressions as "Commanding Officer," "Medical Officer," etc.; record only the ----- and ----- of the ship, station, or other activity submitting the certificate.
5. Item 6, "Aviation," of NavMed-N is to be completed only on ----- duty personnel.
6. When positive identification of a corpse cannot be established, rolled impressions of all 10 fingers, if possible, or of all fingers available, shall be taken and forwarded to the Bureau on the reverse side of the NavMed-N or on a blank sheet of paper with the impression of each digit -----.
7. For a death which occurred outside the limits of a naval activity, the name of the ----- unit within which the death occurred should be recorded on NavMed-N in Item 25 "Place of Death."
8. The medical certification section (Cause of Death) of NavMed-N is that recommended by the National Office of ----- and is in use throughout the United States.
9. In Item 27, "Cause of Death" section, of NavMed-N, the sequence of events leading to death shall be recorded, with the underlying cause being stated -----.
10. Whenever an ----- or toxicological examination is performed, the findings shall be recorded in Item 30 of the NavMed-N.
11. When death of active duty personnel occurs away from command, information relative to ----- or ----- status shall be included in Item 30 of the NavMed-N.
12. In general, civil authorities have no jurisdiction over deaths which occur on naval reservations except where the State has retained ----- jurisdiction with the United States.
13. Any activity of the Navy or Marine Corps receiving information regarding the death of an inactive member of the Naval or Marine Corps Reserve, having occurred in its -----, shall, if the death has not been reported, report the death by ----- to the Chief of Naval Personnel for Naval Reserve Personnel or to the Commandant of the U. S. Marine Corps for Marine Corps Personnel.

14. A transit or burial permit, issued by the proper ----- authority, is required for removal of a body from a naval reservation for either shipment or burial.
15. It is the duty of the ----- to send a letter to the next of kin, expressing condolences and giving any details concerning the death that are deemed appropriate for inclusion.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

16. When a death occurs at a naval activity or in a naval vessel, the responsibility for reporting the death to the Secretary of the Navy rests with the
1. commandant or fleet commander, respectively
 2. commanding officer
 3. executive officer
 4. medical officer or Medical Department representative -----
17. If full information required in reporting a death is not available, the dispatch to the Secretary of the Navy should
1. be sent immediately with whatever data is available, to be supplemented with complete information at the earliest practicable date
 2. be delayed until all required information is available
 3. be held for 24 hours before being sent
 4. not be sent, but should be replaced by a letter report -----
18. Which of the information listed below is not normally included in the dispatch report of death sent to the Secretary of the Navy?
1. Full name, relationship, and address of next of kin
 2. Current rate of pay
 3. Information on civilian insurance
 4. Disposition that has been or will be made of remains -----
19. Death of a civilian employee of the Navy, which occurs at a naval activity or in a naval vessel to which the employee was not permanently attached, shall be reported by dispatch to the Secretary of the Navy with information copy of the dispatch to
1. the employee's next of kin
 2. the Bureau of Employees' Compensation
 3. the American Red Cross
 4. the employee's permanent duty station -----

20. When a member of the Department of the Army dies at a naval activity or on board a naval vessel, the commanding officer shall report the death by
1. dispatch to the Adjutant General's Office, Department of the Army—information to the Secretary of the Navy
 2. dispatch to the Secretary of the Navy—information to the Adjutant General's Office, Department of the Army
 3. telephone or dispatch to the nearest Army installation
 4. by dispatch to the Secretary of the Army -----
21. Item 5, "Length of Service," on a NavMed-N for an inactive member of the Fleet Reserve, who transferred to the Fleet Reserve (inactive duty) after 21 years and 9 months continuous active duty and who has been in the Fleet Reserve for 3 years but has never performed active duty in the Fleet Reserve, should be completed as
1. 21 years 9 months
 2. 22 years
 3. 24 years 9 months
 4. 25 years -----
22. If a man on leave from the U. S. S. *Chicago* becomes ill or is injured and is admitted directly to the U. S. Naval Hospital, Long Beach, Calif., and from that hospital he is transferred as a patient to the U. S. Naval Hospital, Bethesda, Md., where he dies, Item 23, "Admitted to the Sick List From," of the NavMed-N submitted in this case should be completed as
1. U. S. Naval Hospital, Long Beach, Calif.
 2. U. S. Naval Hospital, Bethesda, Md.
 3. U. S. S. *Chicago*
 4. U. S. Naval Hospital, Long Beach, Calif. via
U. S. S. *Chicago* -----
23. On NavMed-N, Item 24, "Date Admitted to Sick List," shall, in every case, be completed by recording the month, day, and year the individual was
1. first diagnosed with the diagnosis which is listed as the disease or condition directly leading to death
 2. first shown on the sick list of the activity at which death occurred
 3. admitted to the sick list for the continuous stay that terminated in death -----

24. Which one of the cases of death listed below, occurring at a naval hospital, does not require dispatch reporting to the Secretary of the Navy?
1. Death of a Veterans Administration Beneficiary
 2. Death of a member of the U. S. Coast Guard, when the Coast Guard is not operating as a part of the U. S. Navy
 3. Stillbirth death
 4. Death of a civilian humanitarian patient -----
25. Civil death certificates, for deaths which occur at naval activities in the United States, may be prepared and signed by a naval medical officer only when
1. the deceased personnel were on active duty
 2. such action is requested by the civil authorities
 3. the activity is in an isolated area
 4. there is no question concerning the cause of death -----

INSTRUCTION TEST

Assignment No. 33

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. When funeral and burial expenses are authorized by law, the amount allowed for services prior to burial in a National Cemetery is a sum not to exceed \$-----.
2. When allowed by law, and no contract is available, the Government will pay for the preparation and encasement of remains by a private undertaker, the sum allowed being limited to \$-----.
3. If suitable clothing is not available in which to bury the naval dead, new clothing shall be obtained and charged to the appropriation -----, -----.
4. The remains of naval dead shall be prepared for interment or shipment under the supervision of a -----
-----.
5. When a body is to be buried in uniform, the uniform shall be complete except for the cap and -----.
6. When the remains are shipped by express, ----- pounds of personal effects are allowed to be shipped with the remains at no extra charge.

7. If a body is forwarded to the next of kin or other consignee, the consignee shall be informed by ----- of the time and method of forwarding, and if practicable, the routing and scheduled time of arrival.
8. The bodies of naval personnel who die within the continental United States shall, when practicable, be sent to the nearest -----.
9. When a body is shipped by rail on a transportation request, an ----- must accompany the remains.
10. When a body is shipped by express, it will be handled by the carrier from the point of origin to the -----.
11. The appropriation "Medical Care, Navy" is chargeable with the cost of ----- burial of pensioners who die in a naval hospital, destitute patients who die in a naval hospital, and unclaimed bodies.
12. United States National Ensign No. ----- is the standard funeral flag.
13. When embalming of naval dead is to be accomplished by naval personnel, it shall be done in accordance with instructions contained in the ----- of the -----.
14. A standard Navy or ----- casket shall be used, when available, for encasement of remains of naval dead.
15. When an officer of the navy dies, the commanding officer will cause all the personal effects of the decedent to be collected and inventoried by ----- officer(s).

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

16. A patient with known diabetes of 10-years duration develops gangrene of the right great toe. Five days later he develops a staphylococcic septicemia and on the third day thereafter dies. Box (a), (b), and (c) of Part I of "Cause of Death" section of NavMed-N shall be completed as
 1. (a) Diabetes mellitus, 10 years
(b) Gangrene, rt. great toe, 8 days
(c) Septicemia, staphylococcus, 3 days
 2. (a) Septicemia, staphylococcus, 3 days
(b) Gangrene, rt. great toe, 8 days
(c) Diabetes mellitus 10 years
 3. (a) Gangrene, rt. great toe, 8 days
(b) Septicemia, staphylococcus, 3 days
(c) Diabetes mellitus, 10 years

17. Which *one* category of information listed below would not normally be shown in Item 30, "Summary of Facts Relating to Death," of the NavMed-N ?
 1. Disposition of remains
 2. Character and date of operations
 3. Facts concerning the origin of the disability causing death
 4. Information as to how remains were identified -----
18. When a person is reported "missing" the NavMed-N
 1. shall be submitted via airmail
 2. shall be submitted via the Chief of Naval Personnel
 3. shall not be submitted
 4. shall be submitted to the Secretary of the Navy -----
19. When death of a person in the naval service occurs outside the limits of a naval reservation, the body shall not be moved by naval personnel until
 1. the commanding officer of the deceased has been notified
 2. a medical officer of the Navy has viewed the body and pronounced the person dead
 3. the next of kin grants permission
 4. permission has been obtained from proper civil authorities -----
20. When death occurs in a naval hospital or at a shore station within the continental limits of the United States having a contract for the care of the dead, and the next of kin resides in the United States, the dispatch notification to the next of kin shall be sent by
 1. the commanding officer of the hospital or station
 2. the Bureau of Medicine and Surgery
 3. the Bureau of Naval Personnel
 4. the Secretary of the Navy -----
21. When the next of kin designates burial in a private cemetery, and funeral and burial expenses are allowed by law, the government will pay such expenses up to but not exceeding a sum of
 1. \$50.00
 2. \$100.00
 3. \$125.00
 4. \$150.00 -----
22. Embalming and encasement expenses will not be paid by the Government for personnel classed as
 1. USN-USMC active duty
 2. USN-USMC retired inactive
 3. USNR-USMCR active training duty
 4. accepted applicant USMC -----

- 23. Which one of the expense items listed below, incident to naval deaths, is not authorized for payment by the Government?**
1. Undertaker's services
 2. Clergyman's services
 3. Coroner's inquest
 4. Transportation of immediate relatives to cemetery -----
- 24. The bodies of naval dead shall be inspected after preparations for burial or shipment are complete, and the conditions noted on such inspections shall be made the subject of a memorandum report**
1. to the next of kin
 2. to the undertaker
 3. for forwarding to the Bureau
 4. for file with the clinical record of the deceased -----
- 25. When available services of the Government are proffered but are refused and the relatives take charge of the remains of Navy or Marine Corps dead, the expenses of preparation, encasement, and transportation may be allowed by the Department of the Navy in an amount not to exceed**
1. what it would have cost the Government had available services been utilized
 2. what it would have cost the relative to bury a nonservice relative in that locality
 3. \$300.00
 4. \$450.00 -----

*MEDICAL DEPARTMENT FINANCIAL MANAGEMENT AND RELATED PROCEDURES

FINANCIAL MANAGEMENT

I. General

A. Bureau Responsibility: The Bureau of Medicine and Surgery is charged with the responsibility for the administration of appropriations under its cognizance. This responsibility is imposed by title 5, U. S. Code, section 430, which states:

"The several bureaus shall retain the charge and custody of the books of records and accounts pertaining to their respective duties, and all of the duties of the bureaus shall be performed under the authority of the Secretary of the Navy, and their orders shall be considered as emanating from him and shall have full forces and effect as such."

Responsibility for proper expenditures of appropriations and prohibition against expenditures in excess of any appropriation are established by title 31, U. S. Code, section 665. Article 1264, *Navy Regulations*, restates, in part, this legislation and places similar responsibility not only on the bureaus and offices of the Navy Department, but also on all persons in the Naval Establishment for proper expenditures of allotments granted by the respective bureaus.

B. Appropriation: An appropriation is an authorization by an Act of Congress to incur obligations for specified purposes and to make payments out of the Treasury to

*At the time of revision of this course material, many of the forms and procedures in use in naval hospitals are in process of being changed. Such changes are incident to the establishment of Navy Stock Fund financing of "in-store" materials and the complete revision of hospital accounting instructions. For this reason, forms and procedures described in the subsections to follow are not applicable to naval hospitals unless specifically so stated.

liquidate such obligations, both the incurring of obligations and the making of payments being restricted by prescribed time and/or monetary limitation.

Terminology:

1. *Appropriation*: An appropriation is an authorization by an Act of Congress to make payments out of the Treasury for specified purposes.

2. *Obligation*: An obligation consists of orders placed, contracts awarded, services received, and similar transactions during a given period requiring future payment of money.

3. *Appropriation Expenditure*: The amounts of approved vouchers, claims, or other documents which have been entered in the accounts of the agency as final charges against an appropriation for expenditure.

4. *Fiscal Year*: The fiscal year of the U. S. Government is the period beginning 1 July and ending 30 June of the following calendar year. The fiscal year is designated by the calendar year in which it ends, for example, the fiscal year 1956 is the period beginning 1 July 1955 and ending 30 June 1956.

5. *Current Fiscal Year*: The fiscal year in progress.

6. *Unexpired Appropriation*: An unexpired appropriation is one which is available for incurring obligations during the current fiscal year.

7. *Expired Appropriations*: An expired appropriation is one which is no longer available for obligation but is still available for disbursement to liquidate existing obligations.

8. *Closed Appropriation*: A closed appropriation is one the balance of which has been carried to the surplus of the Treasury and is therefore no longer available for obligation or payment of obligations.

9. *Appropriation Title*: An appropriation title is a descriptive phrase assigned for purposes of identification to an appropriation account or accounts.

Example: Medical Care, Navy

10. *Appropriation Symbol*: An appropriation symbol is a combination of numbers, or of numbers and the letter "X," established by the General Accounting Office to designate a particular appropriation:

Example:

			1761002
Navy Department.....	<u>17</u>	<u>6</u>	<u>10</u> <u>02</u>
Fiscal Year 1956.....		↑	↑
Bureau of Medicine and Surgery.....			↑
Appropriation: Medical Care, Navy.....			↑

11. *Appropriation Subhead:* An appropriation subhead is a subdivision of an appropriation. Subheads are designated by numbers suffixed to appropriation symbols.

Examples: a. 1761002.28

↑

Subhead: Medical service, Supplies, and equipment at other facilities

b. 1761002.40

Navy Department.....	<u>17</u>	<u>6</u>	<u>10</u>	<u>02</u>	<u>40</u>
Fiscal Year.....		↑	↑	↑	↑
Bureau of Medicine and Surgery.....			↑		
Appropriation: Medical Care, Navy.....				↑	
Subhead: Care of the Dead.....					↑

12. *Classes of Appropriation:*

a. **One Year Appropriation:** One Year appropriations are generally made for current operating and maintenance expenses of the Naval Establishment. One Year appropriations become available for obligation and expenditure at the beginning of a fiscal year designated in the appropriation act. They are available for incurring obligations only during the specified fiscal year; however, they are available for the payment of such obligations during the specified fiscal year and for two fiscal years thereafter. At the end of the 2-year period of expenditure availability, or of such other period as has been approved by Congress, any unexpended balance in annual appropriations reverts to the Treasury.

The third digit in the appropriation symbol designates the fiscal year:

Examples: One Year Appropriation 17 6 10 02

Fiscal Year 1956..... ↑

17 5 10 20

Fiscal Year 1955..... ↑

b. Multiple-Year Appropriation: A multiple-year appropriation is one which is available for incurring obligations for a definite period in excess of one fiscal year. Such appropriations are available for payment of obligations incurred only during the fiscal years specified in the act. However, they are available for the payment of such obligations for two fiscal years thereafter. At the end of the 2-year period of expenditure availability, or of such other period as has been approved by Congress, any unexpended balance in a multiple-year appropriation reverts to the Treasury.

The third and fourth digit in the appropriation symbol designates a multiple-year appropriation;

Example: Multiple-Year Appropriation 17 .5/6 10 02

ation
 Beginning Fiscal Year,
 1955-----
 Ending Fiscal Year, 1956-----

↑
 ↑

The multiple-year appropriation in the above example is available for incurring obligations beginning 1 July 1954 and ending 30 June 1956. It is available for payment of such obligations during the 2 fiscal years specified plus two fiscal years thereafter or until 30 June 1958.

c. No-Year Appropriation: No-year appropriations are usually made for shipbuilding, public works, and other special programs. No-year appropriations become available for obligation and expenditure at the beginning of the fiscal year following the passage of the appropriation act, or they may become available immediately if so specified in the act. They are available for obligation and expenditure until exhausted or until the purpose for which they were made has been accomplished. When the purpose of a no-year appropriation has been accomplished, any unexpended and unobligated balance reverts to the Treasury.

The No-Year Appropriation is designated by the placing of the letter "X" in the appropriation symbol in place of the third digit.

Example: No-Year Appropriation: 17 X 10 02

No-year appropriation-----↑

A listing of the appropriation title and symbol of each naval appropriation is contained in the *Navy Comptroller Manual*, paragraph 022301.

The appropriation title, symbol, and subhead number must appear on all documents employed in incurring obligations and/or making expenditures. The activity accounting number, Bureau Control Number, applicable expenditure account number, and object classification symbol will also be placed on such documents.

C. Budget Estimates:

1. The budget estimate of the Department of the Navy is a detailed estimate of the moneys required to be appropriated for the Naval Establishment in a regular appropriation act.

2. The Chief of the Bureau is charged with the responsibility for the preparation of estimates for funds to carry out the duties of the Bureau, by title 5, U. S. Code 431, which states:

“All estimates for specific, general, and contingent expenses of the Department, and of the several bureaus, shall be furnished to the Secretary of the Navy by the chiefs of the respective bureaus.”

3. Budget estimates prepared by the Bureau are based on: (a) Naval policy; (b) current operating, development, and personnel plans approved annually by the Secretary of the Navy; (c) records of past requirements and expenditures; and (d) future requirements.

D. Expenditure Accounts:

1. Purpose:

a. Cost Accounting: Expenditure account numbers classify expenditures according to the end use or purpose for which such expenditures are made. The reason for so classifying expenditures is to provide a detailed analysis of the cost of maintaining and operating the Navy Department and the naval service.

b. Need for Cost Accounting: A detailed cost analysis of Navy Department expenditures is required in order to accomplish the following:

(1) Effective administrative control of the purposes for which appropriations and funds are expended.

(2) Preparation of budget estimates which correctly reflect the requirements of the Department of the Navy and which can be justified successfully before Congress.

(3) Preparation of statistical reports required by Congress, showing the purposes for which appropriations and funds have been expended.

(4) Comparison of the cost of performing work between activities within the Naval Establishment.

2. Numbering Plan:

a. Major Series: Each expenditure account has been assigned a five digit number. The accounts are grouped under nine major headings. The first digit of each account number designates the applicable major heading for the nine major series of expenditure account numbers. The major headings and the numbers assigned to them follow:

- 1—naval vessels
- 2—ordnance
- 3—aircraft, engines, and other equipage
- 4—naval activities and offices
- 5—stores purchases and transfers
- 6—manufacturing for stores and repairs and alterations to materials and equipment in store
- 7—military pay and allowances and general expenses of military personnel
- 8—departmental and operating forces other than ships and aircraft
- 9—accounts receivable, accounts payable, losses in stores, and miscellaneous expenditures

b. Secondary Series: The second digit of each account number, combined with the first digit, designates the applicable heading for the secondary series; i. e.,

- 11—acquisition of naval vessels (hull, machinery, and permanent fittings) by construction, purchase, or issue from store

12—equipage, including installed electronic equipment, spare parts sets, and spares classed as equipage, furnished to naval vessels

13—consumable supplies (including hull and machinery allowance list items not classified as equipage, and miscellaneous services furnished to naval vessels)

99—losses in stores and miscellaneous expenditures

The remaining digits of account numbers provide a further breakdown, by purpose or type of expenditure, of the major and secondary series of accounts. The *Navy Comptroller Manual*, volume 2, provides a description of each prescribed expenditure account.

3. *Naval Vessels* (10000 Major Series)

a. 12000 Series: Equipage

(1) *Other than First Outfits*: Expenditure accounts in the 12000 series for equipage, spare parts sets, and spares classified as equipage, issued to naval vessels as other than first outfits of such items, have as the third, fourth, and fifth digits the vessel type number listed in paragraphs 024371 and 024372, *Navy Comptroller Manual*.

Examples:

Expenditure Accounts

12111	Naval Vessels.....	1	2	111
	Equipment.....		↑	↑
	Battleship (BB)—(ship type No. 111)...			↑
12145	Naval Vessels.....	1	2	145
	Equipment.....		↑	↑
	Light Cruisers (CL)—(ship type No. 145)...			↑

b. 13000 Series: Consumable Supplies

(1) *Other than First Outfits*: Expenditure accounts in the 13000 series will be used for consumable supplies issued to naval vessels, other than those issued as first outfits of hull and machinery allowance list items not classified as equipage, and for miscellaneous services furnished to naval vessels. In this usage of the 13000 series, the third, fourth, and fifth digits consist of the vessel type numbers listed in paragraphs 024371 and 024372 *Navy Comptroller Manual*.

Examples:	Expenditure Accounts		
13111	Naval Vessels.....	1 3	111
	Consumable supplies.....	↑	↑
	Battleship (BB).....		↑
13161	Naval Vessels.....	1 3	161
	Consumable supplies.....	↑	↑
	Destroyer (DD) (DDE) (DDR) (DL) ..		↑

E. Object Classification:

1. *Use of Object Classes:*

Object classes will be used in submitting estimates to the Bureau of the Budget, Executive Office of the President; and in reporting data whenever analyses by object class are required. This classification is based upon the nature of the services, articles, or other items involved, as distinguished from the purpose for which such obligations are incurred. Thus, items such as personal services, supplies, and materials are to be classified as such even though they may be used in the manufacture of equipment or in the erection of structures.

2. *List of Prescribed Object Classes:*

The object classes and their two-digit numerical code prescribed by Budget-Treasury Regulation No. 1, Revised September 1953, are as follows:

Personal services.....	01
Travel.....	02
Transportation of things.....	03
Communication services.....	04
Rents and utility services.....	05
Printing and reproduction.....	06
Other contractual services.....	07
Supplies and materials.....	08
Equipment.....	09
Land and structures.....	10
Grants, subsidies, and contributions.....	11
*Pensions, annuities, and insurance claims.....	12
*Refunds, awards, and indemnities.....	13
*Interest.....	14

*Not applicable to Medical Department of the Navy.

Taxes and assessments.....	15
*Investments and loans.....	16

3. *Navy Object Classes:*

Object classes as shown in the preceding paragraph have been devised to meet the requirements of the Bureau of the Budget and to furnish the Navy Department with the necessary data for preparing estimates of annual appropriation requirements for submission to the Bureau of the Budget. Various bureaus and offices of the Navy Department require a more detailed classification by nature of the materials or services than that covered by the Budget-Treasury object classes; therefore a third digit has been added to the two-digit object class to provide the additional information, and this three-digit number becomes the Navy object class.

4. *Numbering Plan:*

The first and second digits of a Navy object class denote the object class prescribed by the Budget-Treasury Regulation. The third digit denotes the subdivision of the prescribed object class required by the Navy Department for budgetary purposes. In some classes where no such additional classification is required, the third digit will be unassigned and the numerical symbol will be zero.

Examples:

Personal services:	01	1
Personal services (prescribed object class).....	↑	↑
Departmental (Navy subclass).....		↑
Communication services:	04	0
Communication services (prescribed class).....	↑	↑
(Indicates no Navy subclass).....		↑
Supplies and materials:	08	3
Supplies and materials (prescribed class).....	↑	↑
Office supplies (Navy subclass).....		↑

5. *Definitions of Object Classes:*

For further information and definitions of each of the prescribed two-digit object classes, and applicable three-digit Navy object classes, refer to volume 2, chapter 6 of the *Navy Comptroller Manual*.

*Not applicable to Medical Department of the Navy.

F. Accounting Numbers:

1. *Definition:* An accounting number is a numerical symbol assigned by the Comptroller of the Navy to ships, aircraft units, and ashore activities for purposes of identification on all documents entering into accounting processes.

2. *Construction of Accounting Numbers:* Accounting numbers consist of three, four, or five digits. All accounting numbers are shown in numerical order in paragraph 025100, *Navy Comptroller Manual* and the various types of activities and ships are shown in alphabetical order in paragraphs 025200 through 025207, *Navy Comptroller Manual*.

3. *Use of Accounting Numbers:*

a. *For Activity or Ship Identification:* On primary accounting papers, the accounting number serves as a positive means of identifying the chargeable activity or ship. The preparation of accounting officers' reports is facilitated by the use of the accounting number in lieu of the name of each activity or ship for which issues of material are made or labor is expended.

b. *Identification for Cost Accumulation:* In addition to serving as a means of identification in the field, the accounting numbers are used as codes for cost accumulation. From the stores returns and labor reports of fiscal officers and from the returns of Navy regional accounts officers, the first cost of each ship and activity is accumulated by the use of such codes. The maintenance and operating costs of activities and ships are also accumulated by the individual accounting numbers in the same manner as the first costs.

c. *Use on Primary Documents:* The proper accounting number of the chargeable ship or activity will be entered on all primary accounting papers, such as public vouchers, Receipts/Expenditure Invoices (SandA Form 127), and local work requests. The responsibility for the correctness of this entry is lodged against the activity preparing the accounting papers. In the case of issues of ships, care must be exercised to insure the use of the ship accounting number on primary papers as distinguished from the ship type accounting number which is used only as the last three digits of certain expenditure account numbers.

Example: 3063 is the accounting number of the *U. S. S. Missouri* BB63 and thus accounting papers bearing that number identifies that vessel in the accounting offices.

II. Allotments

A. General:

1. *Terminology*: An allotment is an authorization by the head or other authorized employee of an agency to incur obligations within a specified amount pursuant to an appropriation or other statutory provision.

2. *Authority to Incur Obligations*:

a. Authority for obligation of funds is usually granted by allotments (Allotment or Suballotment Authorization, NavCompt 372). No obligation shall be incurred against any appropriation unless sufficient funds are available under an allotment, granted for the purpose, except in cases of emergency as authorized by *Navy Regulations* or MMD.

b. Allotments are granted to cover sums approved by the Bureau after its review of an activity's estimate(s) of financial requirements. Upon approval of the estimates as submitted by the field activity, or as modified by the Bureau, the estimate of financial requirements serves as the basic financial plan of the activity for the fiscal year.

c. In the event it becomes necessary in emergencies to obligate funds in excess of an existing allotment, or in the absence of an allotment, a report of the circumstances, accompanied by a request for allotment, or a change in existing allotment, shall be forwarded to the Bureau by letter or dispatch.

d. Certain ships and shore stations are authorized to incur obligations against allotments maintained in the Bureau. Annually the Bureau promulgates instructions concerning authorizations. These instructions establish monetary limitations, and direct the manner in which the activity receiving such authorizations will report expenditures and obligations.

3. *Authorization and Use of Funds Allotted:*

a. The allotment authorization forwarded to the activity indicates the project allotment number, the appropriation, the administrative subhead, the purpose, the quarterly or other apportionment, and the total sum granted.

b. The total amount allotted by project, as indicated by the allotment authorization, shall not be exceeded without prior Bureau approval, except as provided for in *Navy Regulations*. Obligations must be limited to the amount allotted within the quarter plus unobligated balances carried forward from previous quarters of the same fiscal year. Funds may be interchanged between Navy object classes within the project without prior Bureau approval unless directed otherwise. When such change of funds is made, no adjustment is to be made in the allotment records. Allotment records thus reflect the difference between the funds authorized and obligations incurred or expenditures made.

c. Individual local allotments are granted to shore stations (except Navy and Marine Corps recruiting stations, officer procurement offices, reserve training centers of the Navy and Marine Corps, and NROTC units, and such others as may be designated) and hospital ships. In accordance with such instructions as may be issued from time to time, these individual local allotments may be charged for the procurement of technical medical supplies, equipment, and services.

4. *Modification of Allotments:*

a. Requests for modification of allotments shall be submitted to the Bureau as circumstances require. Such requests shall be submitted as soon as practicable after the need therefor becomes apparent in order that the Bureau may be fully apprised of the change in operating fund requirements of the activity and take such action as it deems necessary.

b. Requests for modification of allotment shall, except in cases of immediate urgency, be submitted by letter in accordance with current instructions, furnishing a detailed

statement of justification and outlining the specific circumstances necessitating the request for modification.

c. In case of emergency, a dispatch, confirmed by letter, may be used to request increase in allotment using the following form:

“REQUEST ALLOTMENT NUMBER (———)
BE INCREASED (*state amount*) (———) QUAR-
TER FISCAL YEAR (———) X INCREASE
REQUIRED DUE TO (*state briefly circumstances*
justifying reason for modification) X

d. In case of emergency in which a delay incident to obtaining Bureau approval in advance of incurring obligations would endanger human life or Government property, the commandant or senior officer present may authorize work to be started or purchase to be made. In each instance, the procedure prescribed above regarding request for modification shall be complied with at the earliest practicable time. Reference shall be made to the specific authorization by the commandant or senior officer present to obligate funds in advance of Bureau approval when submitting request for increase or modification of allotment.

5. *Records and Reports:*

a. All official allotment accounting records will be maintained by the fiscal office of the activity to which the allotment is issued.

b. Records, reports, and report of allotment expenditures are required by the Bureau for the purpose of compiling reports to other governmental agencies and higher echelons, and for future estimating and budgetary requirements. These records shall be maintained and required reports submitted in accordance with the *Manual of the Medical Department* and current Bureau of Medicine and Surgery Instructions.

c. Medical and dental property accountability for vessels shall be maintained on board in the manner prescribed in current directives. For information to be submitted in financial reports, refer to Bureau Instructions and other current directives.

6. *Bureau Allotments:*

The Bureau maintains allotments under certain projects, identified by Bureau control number, to which expenditures not feasibly covered by field allotments are charged. Expenditures of funds against allotments maintained in the Bureau shall not be reflected in local allotment records. However, the activity shall enter the material or services received on appropriate records as a transfer voucher received.

7. *Estimates of Financial Requirements:*

In order to obtain data on which to base allotments of funds, the Bureau issues an annual "Call for Estimates" directive to all activities from which estimates of financial requirements are needed. Activities receiving such directives shall prepare and submit estimates to the Bureau in accordance therewith. Estimates for normal operating purposes shall be evenly distributed throughout the fiscal year insofar as practicable. Procurement of special items shall be planned for accomplishment in sufficient time to provide liquidation of obligations so far as is practicable prior to the close of the fiscal year.

8. *Allotment Numbering and Identification:*

The number assigned to an allotment authorization is called the Bureau control number, and always consists of five digits.

a. The first two digits identify the project under a specific budget activity of the appropriation.

b. The last three digits identify the allotment and designate the activity to which it is granted, or indicate an "open" allotment:

Examples:

Bureau Control Project Allotment Number:

	<u>20</u>	<u>127</u>
Medical and Dental Care in Shore	↑	↑
Stations.....		
U. S. Naval Air Station, Quonset		
Point, R. I.....		

Bureau Project Allotment Control Number:

	<u>12</u>	<u>001</u>
Medical and Dental Care Afloat.....	↑	↑
Open Allotment (maintained in the Bureau).....		

9. *Unexpended Balances of Allotments:*

a. Within Fiscal Year: Unexpended balances of quarterly allotments will be carried forward to succeeding quarters of the fiscal year. The administering bureau has the right at any time to increase or decrease an allotment in accordance with the policy and plans as determined by appropriate authority, but such changes are to be consistent with approved apportionments.

b. End of Fiscal Year: At the end of the fiscal year, allotments will remain available for charges to cover the liquidation of outstanding obligations.

B. Open Allotments:

1. *Definition:*

An open allotment is an allotment made by the head of a bureau or office in a specific amount, published for charge for specified purposes by designated officials, without specific limitation as to any individual official. An open allotment is issued when regular allotments are impracticable of administration.

2. *Scope:*

Open allotments are issued under a bureau project and are limited to the scope of that project to the same extent as regular allotments. In addition, each open allotment is restricted to the specific functions or transactions designated to be financed by that allotment. Charges to open allotments may be authorized only by the officers or employees designated by the administering bureau or office.

3. *Amplifying Instructions:*

In addition to the restrictions on the use of open allotments contained herein, additional instructions and limitations may be issued by the administering bureaus and offices which must be adhered to.

4. Open Allotments Other Than for First Destination Transportation:

a. General: For certain specified purposes open allotments have been established against which field activities may initiate charges, without prior bureau authority, upon approval of an official authorized to initiate such charges. No allotment accounting or reporting is required from field activities for charges to these open allotments. The requirement as to furnishing copies of paid vouchers varies and is indicated under each open allotment listed. In those cases where vouchers are required they will be submitted to the bureau authorizing the open allotment.

b. Open Allotments Authorized By BuMed:

1761002.28 Purpose: To cover expenditure of funds by all 12001* ships, except hospital ships, for technical medical and dental materials and services.

Authority to Charge: Commanding officers of active Navy vessels and fleet operating units, excluding MSTs vessels, yard craft, and vessels of the reserve fleet.

1761002.40 Purpose: Care of the Dead. To cover 30001 all expenses for care of the dead. Bills for secondary burial expenses and mortuary services where no contract exists will be forwarded to the Bureau for review and payment in accordance with the MMD., unless commands are specifically authorized to pay secondary burial expenses and mortuary services where no contract exists.

Authority to Charge: All commanding officers.

1761002.40 Purpose: To cover care of Korean theatre dead 31001* including the services rendered in care of the re-

mains, bills of lading for shipment of the body, and TAD expenses of escorts.

Authority to Charge: All officials authorized to issue government bills of lading and travel orders and the commanders of the Third and Twelfth Naval Districts.

*Copies of paid vouchers will be forwarded to the Bureau of Medicine and Surgery.

III. Medical Department Funds for Ships and Fleet Operating Units:

A. General:

1. As set forth in paragraph 023304, *Navy Comptroller Manual*, authorization for expenditure of funds under the appropriation Medical Care, Navy, is provided the commanding officers of operating units of the fleet and of each type of vessel in commission with a medical or dental representative attached, except for hospital ships and vessels assigned to the Reserve Fleet or the Military Sea Transportation Service.

2. Type vessels and fleet operating units listed in BuMed Instructions, 7000 series, are authorized to make expenditures under the appropriation Medical Care, Navy, against an open allotment maintained in the Bureau of Medicine and Surgery. Individual allotments will not be granted except under unusual circumstances.

3. Fleet operating units such as naval cargo handling battalions, naval beach groups, air wings, etc., which are not listed, are authorized to make expenditures, in accordance with these Instructions, under the appropriation Medical Care, Navy, against an open allotment maintained in the Bureau of Medicine and Surgery. Such units shall submit a report of their requirements to the Bureau in accordance with paragraph E.

B. Quarterly Target Amounts:

1. The amounts set forth are quarterly target amounts

to be used for budgetary guidance of commanding officers to cover the operation of Medical and Dental Departments. These target amounts are not to be considered as inflexible limitations which cannot be exceeded, but rather as an average estimate of what is considered a reasonable requirement for each type vessel or fleet operating unit. In the event it is found that the target amount will be exceeded because of operational commitments, major replacements of equipment, or unforeseen requirements, the necessary funds may be obligated without reference to the Bureau. However, for fiscal management purposes within the Bureau, a supplementary report of estimated obligations should be submitted in accordance with paragraph H.

2. The target amounts established by the type vessel are for the operation of the Medical Department. A separate and additional target amount is included for vessels having a Dental Department. This additional target amount is based on the number of dental officers attached; i. e., for a vessel with one dental officer attached the target amount is \$300, with two dental officers attached the target amount is \$600, etc. A further separate and additional target amount is included for the operation of dental prosthetic laboratories on board vessels.

C. Appropriation Responsibility:

1. Under the performance-type budget the appropriation Medical Care, Navy, is chargeable on board ship only for technical medical and dental materials and services. These charges include medical and dental supplies and equipment, medical and dental books, and repairs to technical medical and dental equipment. Such charges as laundry services and supplies, clerical supplies, and repairs to typewriters, utilities, etc., are *not* properly chargeable to the appropriation Medical Care, Navy.

2. By agreement with the Bureau of Ships, Medical and Dental Departments aboard ships may request items of a technical nature to be issued from the supply officer's store-room for use in the treatment of the sick. Such procedure, however, must be limited to emergency cases where time will not permit the procurement of such items from other sources.

Under this agreement, reimbursement to the ship's operating allotment under the appropriation Ships and Facilities, Navy, from the appropriation Medical Care, Navy, will not be required.

D. Utilization of Funds:

Funds authorized by BuMed Instructions, 7000 series are available for the procurement of materials and services as set forth in paragraph C.

1. Items listed in the Armed Services Medical Stock List procured on BuMed Material Requisition (NavMed-4) are issued as NSA material and will be charged to the appropriation Medical Care, Navy. Such materials shall be procured from designated primary or distribution stock points except in the case of emergency. In emergency, local procurement of such items is authorized by chapter 24, *Manual of the Medical Department*. Such local procurement may be by open purchase procedure, or from the Department of the Army or other Government agencies on a reimbursable basis. When materials are received from other Government agencies on a reimbursable basis, the issuing office shall be instructed to forward the Standard Form 1080 with supporting documents to the Bureau of Medicine and Surgery for certification and payment.

2. Open purchase procurement of material is authorized when required. Annual purchase requisitions are no longer required. A request properly submitted to a purchasing activity indicating a charge to an open allotment under the appropriation Medical Care, Navy is adequate authority for an individual purchase. (For overall purchase authority, refer to article 1907, *Navy Regulations*; volume 7, chapter 4, *BuSandA Manual*; and volume 6, chapter 3, *BuSandA Manual*. The latter authority also prescribes purchase methods.)

E. Appropriation Accounting Data:

1. The appropriation data and allotment number applicable to funds authorized are set forth in paragraph 023304, *Navy Comptroller Manual*, and shall be cited on all documents concerned with the obligation or expenditure of funds. Appropriate expenditure account numbers and

object classification, as set forth in volume 2, *Navy Comptroller Manual*, shall also be indicated on all such documents.

2. Appropriation: 1761002.28 MCN 1956

Open allotment number: 12001

F. Records and Reports:

1. Medical and dental property accountability records shall be maintained on board in the manner prescribed in chapter 24, *Manual of the Medical Department*.

2. As set forth in paragraph 023304, *Navy Comptroller Manual*, no allotment accounting records are required to be kept or reports submitted by activities obligating funds under an open allotment. However, it is considered that each vessel or fleet operating unit obligating funds under the appropriation Medical Care, Navy, *should keep memorandum financial accounting records* for management purposes.

3. For management purposes within the Bureau of Medicine and Surgery, each vessel and fleet operating unit shall submit a letter report of obligations expected to be lodged against open allotments during the fiscal year. This report shall be submitted in accordance with BuMed Instructions, 7000 series, and shall reach the Bureau not later than 30 days prior to the beginning of the fiscal year. A supplementary report shall be submitted to the Bureau at any time during the fiscal year when significant changes occur in the estimated obligations. No other financial reports are required.

INSTRUCTION TEST

Assignment No. 34

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. The fiscal year of the U. S. Government is designated by the calendar year in which it
2. Naval shore activities are notified of allotments granted by the receipt of the form NAVCOMPT
3. In order to obtain data on which to base allotment of funds, the Bureau of Medicine and Surgery issues annually a
.....
4. An authorization by the head or other authorized employee of an agency to incur obligations within a specified amount pursuant to an appropriation or other statutory provision is a/an
5. In order to obtain data on which to base allotments of funds, the Bureau issues an annual "....."
directive to all activities from which estimates of financial requirements are needed.
6. The open allotment number under which Medical Department funds are granted to naval vessels other than hospital ships and MSTS vessels is
7. The official allotment accounting and reporting at naval shore stations is accomplished by the of the station.
8. The expenditure account number series used on board naval vessels by the Medical Department when ordering equipment is; and for supplies it is
9. The last three digits of the five digit expenditure account number used for equipment and supplies aboard naval vessels is the
..... number
10. One-year appropriations become available for obligation and expenditure at the beginning of a
11. The awarding of contracts, orders placed, services received, and other similar transactions are known as
12. Appropriations available for incurring obligations during a specified fiscal year is a/an
13. Appropriations available for incurring obligations for a definite period in excess of one fiscal year are
appropriations.

14. Appropriations that are available for obligation and expenditure until exhausted or until the purpose for which they were intended has been accomplished are known as ----- appropriation.
15. Pertaining to the Department of the Navy, a detailed estimate of the money required to be appropriated for the Naval Establishment in a regular appropriation act is a -----.
16. The Chief of the Bureau is charged with the responsibility of the preparation of estimates to be furnished to the ----- of the -----.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

17. An authorization by an act of Congress to make payments out of the Treasury for specified purposes is known as an
 1. allotment
 2. appropriation
 3. allotment expenditure
 4. appropriation expenditure -----
18. Appropriations that are available for incurring obligations only during a specified fiscal year are
 1. no-year appropriations
 2. multiple-year appropriations
 3. One-year appropriations
 4. none of the above. -----
19. One-year and multiple-year appropriations are available for incurring obligations during the fiscal year or years specified in the appropriation act. At the end of this period, they are available for payment of such obligations for
 1. one fiscal year thereafter
 2. two fiscal years thereafter
 3. three fiscal years thereafter
 4. four fiscal years thereafter -----
20. The fiscal year of the U. S. Government begins and ends on which of the following dates?
 1. 1 July to 30 June
 2. 1 January to 31 December
 3. 30 June to 1 July
 4. 31 December to 1 January -----
21. The title of the appropriation of the Medical Department of the Navy is
 1. Medical Department, Navy
 2. Medical Care, Navy
 3. Medical and Dental Care, Navy
 4. Medical Department, Ashore and Afloat, Navy -----

22. The appropriation symbol of the appropriation of the Medical Department of the Navy, excluding the number representing the fiscal year, is
1. 17-1002
 2. 17-1105
 3. 17-1207
 4. 17-1301
-
23. The appropriation subhead number suffixed to the appropriation symbol and designating "Medical services, supplies, and equipment at other facilities" is
1. .11
 2. .21
 3. .28
 4. .40
-
24. The appropriation subhead number suffixed to the appropriation symbol and designated "Care of the dead" is
1. .11
 2. .21
 3. .28
 4. .40
-
25. Which of the following is *not* chargeable on board ship against the appropriation of the Medical Department of the Navy?
1. Medical and dental supplies and equipment
 2. Repairs to technical medical and dental supplies
 3. Clerical supplies
 4. Medical and dental books
-
26. The additional quarterly target amount granted to naval vessels with two dental officers attached is
1. \$300.00
 2. \$400.00
 3. \$500.00
 4. \$600.00
-

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

27. Match the following terms with the appropriate explanatory statement.

A	B
1. unexpired appropriation	an appropriation which is no longer available for obligation but is still available for disbursement to liquidate existing obligations. -----
2. expired appropriation	an appropriation no longer available for obligations or for payment of obligations. -----
3. definite appropriation	an appropriation which is available for incurring obligations during the current fiscal year. -----
4. lapsed appropriation	

PROCUREMENT

I. From Navy Supply System:

Procurement:

It is a responsibility of all cognizant personnel to keep property acquisitions consistent with the requirements of the mission and functions of the activity, to avoid over- and under-stocking of materials, and to insure economical administration of public funds, services, and materials. This responsibility is applicable to hospital corpsmen, as well as to department heads, especially those hospital corpsmen on independent duty.

Materials and services required for the maintenance and operation of medical and dental activities of the Navy including material and services chargeable to Bureau of Medicine and Surgery allotments, and those materials and services chargeable to appropriations of other bureaus of the

Department of the Navy are usually obtained by the following means:

- (a) BuMed Material Requisition (NavMed-4).
- (b) Purchase Requisition (NavSandA Form 44 afloat, or NavSandA Form 76 ashore).
- (c) Stub Requisition (NavSandA Form 129).
- (d) Receipt/Expenditure Invoice (NavSandA Form 127).
- (e) Request for Performance of Work (NavSandA Form 140).
- (f) Letter requests.
- (g) Nav MC-24 QM, Invoice and Receipt; and Nav MC-33-SD, Shipping Order, Invoice and Receipt, Marine Corps.

BuMed Material Requisition (NavMed-4):

Standardized procedures for requisitioning medical and dental material from elements of the Navy Supply System have been established in order that the Bureau may abstract statistical and logistical data as to usage, rates, stock levels, and reserve quantities. All items in the Armed Services Medical Stock List available to the Navy shall, except in emergency, be obtained from supply facilities on BuMed Material Requisition (Nav-Med-4). Items listed in the Armed Services Medical Stock List shall not be purchased locally, except when the need is immediate and will not permit delay incident to procurement from a Navy supply facility or by transfer from another naval activity. In emergency or when otherwise indicated, medical and dental items may be requested from naval supply facilities by messenger, telephone, dispatch, or letter request. Requisitions from ships for items that are in excess of current stock levels based on approved ships' allowance list shall be justified and submitted via official channels to the appropriate supply facility.

Purchase Requisition (NavSandA 76 and 44):

Materials not listed in the Catalog of Naval Material, the Navy Stock List, or carried in stock at Navy supply facilities

or by a supply officer or a Marine Corps installation may be obtained by purchase requisition procedure.

NavSandA 76—Purchase Requisition (Ashore): This is a Bureau of Supplies and Accounts form on which annual requisitions, and individual purchase requisitions are prepared by Medical Department activities *ashore* desiring procurement by purchase requisition.

NavSandA 44—Purchase Requisition (Afloat); in excess material:

This is a Bureau of Supplies and Accounts form used primarily by the Medical Department *afloat* for the preparation of purchase requisitions, and individual purchase requisitions. It is to be used by all Medical Department activities *afloat* desiring open purchase procurement and the procurement on a one-time basis, of a known item.

Stub Requisition (NavSandA Form 129):

Material listed in the General Stores Section of the Catalog of Naval Material or the Navy Stock List may be obtained, for Medical Department use, on stub requisition. This is the form which Medical Department activities use to request Navy Stock Account material from the local supply facility, chargeable to the allotment indicated on the stub requisition, or to request appropriation purchases account material for which reimbursement may or may not be required.

This requisition is used to withdraw from a naval supply facility the items of material listed in the Catalog of Navy Material, General Stores Section or the Navy Stock List that will be a charge to the appropriation, Medical Care, Navy, and the requisitioning activity's allotment.

Preparation:—Stub Requisitions (NavSandA Form 129) are prepared by the authorized requisitioning activity in an original and eight copies, additional copies being prepared as required locally. All items requisitioned on a single stub requisition will be of the same stock class and all stub requisitions will be signed by the head of the requesting department or activity, or by his authorized representative.

Receipt/Expenditure Invoice (NavSandA Form 127):

This is a Bureau of Supplies and Accounts form used by the Medical Department for transferring material between Medical Department activities after transfer (TVI) of material is authorized.

For details on procurement methods (e), (f), and (g), reference should be made to the *Manual of the Medical Department* and other current directives.

Approved requisitions are not to be considered as authority for a field activity to obligate funds in excess of the amounts made by allotments, unless such materials or services are required in emergency.

Materials and services required for the maintenance and operation of Medical Department activities, which are chargeable to an appropriation under the cognizance of the Bureau of Medicine and Surgery, may be procured only when funds are available for the purpose under a specific allotment granted to the activity by the Bureau, except for the following:

1. Material obtained from other Medical Department activities.
2. Material obtained from naval supply facilities.
3. Procurement specifically designated by the Bureau as a charge to an allotment maintained in the Bureau.
4. Local emergency purchase of medicines and of civilian medical, dental, nursing, ambulances and hospital services as authorized in the *Manual of the Medical Department*.
5. Medical Department material or services for certain ships and certain stations to which no allotments are made.

Medicines, and civilian medical, dental, nursing, ambulances, or hospital services, for persons in the naval service, as defined in article 1208, *Navy Regulations*, may be procured without requisition or allotment, but such procurement shall be subject to instructions contained in the *Manual of the Medical Department*.

Certain nontechnical materials and services required for the maintenance and operation of medical and dental

activities are under the control of other bureaus and offices. Procurement procedures for such items are contained in the *Bureau of Supplies and Accounts Manual*.

Standard commissioning allowances for ships and initial outfitting allowances for advance base components will be issued when required without prior action on the part of the Medical or Dental Departments of the ship or unit.

Basic outfitting of Fleet Marine Force Organizations will be governed by the allowances and procedures set forth in the Fleet Marine Force, Medical and Dental Logistic Support Pamphlet published by the Chief of the Bureau of Medicine and Surgery.

The commanding officers or prospective commanding officers of continental activities shall submit requisitions for commissioning allowance materials, except in certain instances wherein the Bureau will signify intention to automatically supply commissioning allowances. Continental activities may request commissioning allowance lists from the Bureau to be used as a guide in preparing requisitions.

Certain types of small vessels not holding Medical Department allotments, and whose requirements for nonstandard medical items are rare, may procure these nonstandard items by applying to the nearest shore station or base regularly supplying vessels of the same type; any shore station or base; naval supply depots; or other ships. A letter request may be used for this purpose.

A. Instructions for the Preparation and Submission of the BuMed Materiel Requisition (NavMed Form 4)

1. Instructions.

a. Application. This instruction is applicable to the requisitioning process for all cognizance "L" items within the Navy Supply System which are listed in the Armed Services Medical Stock List when required for the care and treatment of Navy, Marine Corps, and other authorized personnel.

b. Source of Supply. Except in emergencies, Navy and Marine Corps activities shall obtain all standard items of medical and dental material from elements of the Navy

Supply System. The Medical and Dental Supply office will from time to time promulgate and disseminate information designating primary and reserve distribution stock points together with lists of standard items which each supply facility will stock and issue.

c. Limitations. Until such time as a standard Navy requisition form is adopted, requisitions for medical and dental material (cognizance symbol "L") shall be prepared on NavMed Form 4, except that units of the Operating Forces may use other forms if so directed by fleet commanders. Requisitions shall be limited to one page each. Not more than nine items shall be listed on each such requisition.

d. Emergency Requisitions.

(1) In an emergency or when otherwise indicated, medical and dental items may be requested from naval supply facilities by messenger, telephone, dispatch, or letter request. Justifiable priority indicators and realistic deadline delivery dates must be assigned. Such requests shall include appropriate accounting information. NavMed Form 4 shall not be submitted in confirmation of telephonic, dispatch, or letter requests. In such cases the issuing supply facility will prepare requisition/invoice documents as appropriate.

(2) Supply facilities will consider emergency requests as being for "immediate use" quantities unless otherwise stated, and will issue materials with short remaining-potency dates to satisfy such requests. If the items requested are not available, supply facilities will provide, if possible, a functional substitute.

e. Requirements for Separate Requisitions. Class cognizance symbol "L" materials required for medical and dental purposes shall be requested on separate requisitions by object and expenditure account classification number within each of the categories set forth below:

- (1) Federal Supply Group.
- (2) Federal Supply Class.
- (3) Bureau-controlled items including replacement schedule items.

(4) Items of the above requiring special handling, each type of which shall be separately requisitioned, such as:

- (a) Biologicals.
- (b) Narcotics or units and assemblies containing these drugs.
- (c) Alcohol and alcoholic liquors.
- (d) X-ray film.
- (e) Precious metals.

(5) Whenever items are required in advance of routine shipments, they should be requisitioned separately.

f. Transfer Requisitions (Back Orders).

(1) When requisitioned items are not immediately available for issue and an appropriate substitute cannot be provided, the issuing supply facility will delete the item from the requisition and identify it with an appropriate symbol to indicate that it has been back-ordered and will be delivered when available, or that it has been passed to a higher echelon of supply for action. Items indicated as being in a back-order status shall not be re-requisitioned, except to provide for additional requirements. When material is shipped, the invoice will reference the requisition on which the item was originally requested.

(2) In the event the need for material carried in a back-order status no longer exists, the issuing supply facility should be advised by the requisitioning activity, by speed-letter or other rapid means of communication, to cancel the back-order.

g. Forwarding of Requisitions. Requisitions shall be submitted via official channels, as follows:

(1) Requisitions prepared for other than Bureau-controlled items are to be submitted to the appropriate supply facility. Sufficient copies shall be prepared to provide a copy for each addressee through whom routed, the allotment administrator, the activity performing the allotment accounting, and an original and five copies for the issuing supply facility.

(2) Requisitions for initial outfitting or expansion, or for Bureau-controlled and replacement schedule items,

shall be prepared as above and submitted to the Chief, Field Branch, Bureau of Medicine and Surgery, Sands and Pearl Streets, Brooklyn 1, New York. The reverse of the requisition form shall be used for justification and explanation of the need for these categories of requirement. Requisitioning activities will be kept informed of Bureau action on all such requisitions.

2. *Detailed Instructions.*

a. Classification of Requirement. Leave blank.

b. Requisition Number. Where inclusion in command or other series is required, the requisition shall be numbered in accordance with applicable directives; otherwise, the requisition shall be numbered in regular sequence from a series followed by a dash, and the last two digits of a fiscal year.

c. Accounting Number. In this space indicate the applicable numbers as listed in volume 2, chapter 5, of the *Navy Comptroller Manual* (available in Supply Officer's files).

d. Number of Dental Officers Attached. Self explanatory.

e. From. Enter the official title and mailing address of the requisitioning activity.

f. To. Enter the official title and mailing address of the supply facility from which receiving supply support for medical and dental materials; or the Chief, Field Branch, Bureau of Medicine and Surgery, Sands and Pearl Streets, Brooklyn 1, New York, for requisitions containing materials for initial outfitting, or expansion of shore stations, or for Bureau-controlled and replacement schedule items.

g. Shipping Instructions, Deadline Delivery Dates, and Priority Indicators. Instructions for shipment should be clear and complete, the deadline delivery date and priority indicator realistic and assigned in accordance with instructions provided in paragraph 23004, *BuSandA Manual*.

h. Accounting Data. Immediately under the heading in the space titled "Item Description," indicate the following information on the requisition:

(1) Allotment number chargeable.

(2) Activity performing allotment accounting (include accounting number).

(3) Appropriation and subhead applicable. (The appropriation and subhead appearing on the requisition must apply to all items appearing thereon.)

(4) Expenditure account classification number. Expenditure account numbers classify expenditures according to end use or purpose for which such expenditure is made. Expenditure account classification numbers shall be assigned to each requisition in accordance with *Navy Comptroller Manual*, volume 2, chapter 4, or *MSTS Comptroller's Handbook*, as appropriate. The expenditure account number assigned must apply to all the material on the requisition.

(5) Object classification. (Volume 2, chapter 6, *Navy Comptroller Manual*.)

(6) Total authorized obligations (except in the case of open or target type allotments, the amount specified will not be exceeded unless authorized by the allotment administrator).

(7) If for commissioning outfit or activation of a deficiency requisition, so state.

i. Submitted and Forwarded. Requisitions shall be signed and submitted by the senior Medical or Dental Department representative and forwarded by commanding officer. If either of the above is also the allotment administrator, this title should be inserted under his name. Where the allotment holder or administrator is other than one of the above and the allotment to be charged is not an open allotment, it will be necessary to also obtain a citation of funds from the allotment administrator prior to forwarding to the supply facility. Signatures are required on the "original copy" of each requisition.

j. Item Number. (Numerically 1 through 9.)

k. Stock Number. The stock number preceded by a letter "L" (cognizance symbol) for each item requisitioned shall be entered in this column. *Stock numbers of required items shall be arranged in strict numerical sequence on the requisition.*

l. Item Nomenclature. List the proper item nomenclature of each item opposite the appropriate stock number. Usually a brief description will suffice and need seldom exceed a single-line entry. Care should be taken, however, to cite the type of electrical current, etc., required, as applicable. Double typewriter spacing shall be used in the preparation of requisitions.

m. Unit. Enter the unit of issue on the line opposite the nomenclature in the column headed "unit." The unit shall be listed as designated in the Armed Services Medical Stock List.

n. Requisitioning Objective (Maximum Stock Column). Enter the established quantitative requisitioning objective for each item in accordance with instructions dealing with levels of supply.

o. On Hand. Enter the quantity of the item actually on hand.

p. On Order. Enter all quantities of the item **ordered** but not yet received.

q. Required. Enter the quantity of the item required. Normally this quantity should equal the difference between the figures entered in the "requisitioning objective" (maximum stock) column and the sum of the figures entered in the "on hand" and "on order" columns. Variation of this quantity to equal case-lot packaging is recommended when such variations will not result in the accumulation of excess stocks and the cost is within the allotment limitations of the activity.

r. Unit Cost. Enter the standard unit price of the item from the currently effective price supplement of the Armed Services Medical Stock List.

3. *Short, Damaged, and Unsatisfactory Shipments and Deliveries.*

a. Fiscal Errors. Fiscal errors are defined as those errors in unit cost, extensions, and totals appearing on an invoice. Fiscal errors of a net amount of less than \$5.00 shall be accepted without adjustment and shall not be reported as a discrepancy to the issuing supply facility. Fiscal errors of a net amount of \$5.00 or more for an entire

invoice shall be reported to the issuing supply facility requesting adjustment.

b. **Material Discrepancies.** Unexplained shortages, over-deliveries, or other discrepancies in deliveries shall be made the subject of an immediate report by letter to the issuing supply facility.

(1) **Overdelivery—General.** Reports of overdeliveries shall include a statement as to whether retention of the material is or is not desired, and whether funds are or are not available to cover cost of such material. It is highly important that NO material be returned to a supply facility without specific prior instructions and authorization. Detailed procedures follow:

(a) *Overdelivery Invoiced.* Where overshipment has been invoiced and the material is desired for retention, no discrepancy report is required. In the event an overshipment has been invoiced and material is not desired, the issuing supply facility should be so advised. If overshipment is verified by the issuing supply facility, a credit invoice will be provided and disposition instructions furnished.

(b) *Overdelivery (Above Quantity Invoiced and Requisitioned).* In the case of a verified overshipment which has not been invoiced, the issuing supply facility will prepare and forward the necessary debit invoices if retention of the material is desired by the consignee, or, if not desired for retention, will direct disposition.

(c) *Overdelivery Not Verified.* In those instances where overshipment is not verified by the issuing supply facility, the excess quantity shall be taken up in the accounting records as a Transfer Voucher Received (TVR), citing the specific situation, with the acquisition effected at current standard unit price. If materials are not desired for retention, they should be reported to the commandant or area commander for local redistribution, and if area excess, to the Chief, Field Branch, Bureau of Medicine and Surgery, Sands and Pearl Streets, Brooklyn 1, New York, utilizing Standard Form 120, Report of Excess Personal Property.

(2) **Shortages and Losses in Transit.**

(a) When material is not received within a reasonable length of time after requisitioning, and no information regarding the delay has been received, an inquiry shall be directed to the issuing supply facility through the channels via which the requisition was originally submitted. No specific length of time can be prescribed which would serve as a standard for all activities, due to variations in distance, but such can be determined by a review of the processing time on previous requisitions.

(b) Shortages and apparent losses in transit shall be reported to the issuing supply facility. When the supply facility determines the condition to be its responsibility, it will issue the necessary adjustment invoices and instructions. In those cases where shipment has been made and the issuing supply facility can detect no error in processing, it will issue the appropriate instructions, advising the activity as to:

(1) The point at which tracing action may best be initiated.

(2) Method of shipment.

(3) Number of any bills of lading issued.

(4) Any other pertinent data.

c. Disposition From Records. When the designated receiving activity has not been able to locate missing items after a reasonable length of time, the invoice shall be taken up in the accounting records, and the missing items surveyed in accordance with article 25-21, *Manual of the Medical Department*. A full statement of conditions surrounding nonreceipt of the shipment shall be made on the survey. Refer also to subarticles 25-13(9) (d) and (e), 25-19(2) and 25-20(2), *Manual of the Medical Department*.

d. Damage. Materials received in an unsatisfactory condition due to improper packing or handling shall be receipted for and surveyed for "repair" or other appropriate action. Report shall be made to the issuing supply facility in order that corrective action may be taken. Where a commercial carrier is involved, proper action shall be taken to insure collection for damages, in accordance with *BuSandA*

Manual, volume III, chapter 5, for activities afloat and article 1850 *U. S. Navy Shipping Guide* for activities ashore.

e. A copy of each report of discrepancy in shipment shall be forwarded to the U. S. Naval Medical and Dental Supply Office, Sands and Pearl Streets, Brooklyn 1, New York.

4. *Direct Deliveries.* Direct deliveries under the Navy Stock Fund are not now envisaged. In the event it is deemed desirable to procure materials under the Navy Stock Fund for direct delivery, individual instances will be the subject of specific accounting instructions.

II. Reference Books:

A. Books, Medical and Dental; Procurement of:

1. *General Provisions.* The Federal Supply Service and the Armed Services Medical Procurement Agency annually make running term contracts that cover procurement of professional and technical medical and dental books. It is mandatory that procurement of all such books be made under the authority of these contracts by all naval activities. These contracts are as follows:

a. Federal Supply Service contracts are listed in Class 35 of the Federal Supply Schedule. Procurement of those books listed in Part 1, Section A and Part II of Class 35 is mandatory. Use of other portions of the schedule in Class 35 is optional. Copies of the schedule may be obtained from the Regional Office, Federal Supply Service, General Services Administration, of the region in which the activity is located.

b. The Armed Services Medical Procurement Agency running term contract covers the procurement of professional medical and dental books of all publishers at discount from publishers list price, except those specifically listed in the Federal Supply Service Schedule. Copies of this contract are distributed to all BuMed management control activities, to selected large activities not under BuMed management control, and to Navy purchasing offices. Activities may obtain a copy of this contract by submitting a letter request to the Armed Services Medical Procurement Agency, 84 Sands Street, Brooklyn 1, New York.

2. *Preparation of Purchase Requisitions.* All purchase requisitions shall be submitted only on NavSandA 76 by shore activities and on NavSandA 44 by ships, as applicable and shall be prepared in accordance with the *BuSandA Manual* and current BuMed instructions. The following information shall be included:

a. Item description shall include title of book, author, and publisher.

b. Applicable Federal Supply Schedule item number and contract number shall be included, if available.

c. Full and complete justification of requirement shall be included on all requisitions.

3. *Funds Chargeable.* Procurement of professional and technical medical and dental books is chargeable to the applicable station allotment or open allotment under the appropriation, Medical Care, Navy, at activities granted allotments or authorized to charge open allotments. In the case of medical research activities the appropriation Research and Development, Navy, 17X1319 shall be charged, when applicable. The applicable accounting data shall be indicated on the requisition. The Bureau will assign appropriate accounting data to requisitions received from activities not authorized funds under the appropriation, Medical Care, Navy.

4. *Procedure at Requesting Activities.*

a. The following activities are authorized to prepare and forward requisitions for professional and technical medical and dental books to the Navy Purchasing Office, 3rd Avenue and 29th Street, Brooklyn 32, New York, for centralized purchase buying, except in the case of a single book or a multivolume set of books costing in excess of \$100, the order for which shall be submitted to the Bureau, via the appropriate type commander for ships, for approval:

(1) Activities under the management control of BuMed.

(2) Certain designated naval stations, as listed in OPNAVINST 7100.2 of 6 June 1951, where BuMed is financially responsible for the Medical and Dental Departments.

(3) Medical research activities.

(4) Hospital ships.

b. All addressed activities not specifically authorized in paragraph 6 (a) that have a requirement for professional and technical medical and dental books shall in each instance submit their requisitions to the Bureau, via the appropriate type commander for ships, for approval. After approval, all requisitions will be forwarded by the Bureau to the Navy Purchasing Office, 3rd Avenue and 29th Street, Brooklyn 32, New York, for purchase action as follows:

(1) Purchase requisitions from activities within the continental limits of the United States: Navy Purchasing Office, 3rd Avenue and 29th Street, Brooklyn 32, New York, will place the order for direct delivery of the books to the requisitioning activity.

(2) Requisitions from ships and extracontinental shore based activities: Navy Purchasing Office will place the order for delivery of the books to:

(a) Medical Stores Section, U. S. Naval Supply Depot, Bayonne, New Jersey, in support of the CINCNELM area (with the exception of the Mediterranean area).

(b) Medical Stores Section, General Supply Depot, U. S. Naval Supply Center, Norfolk, Virginia, in support of the Mediterranean and Caribbean area.

(c) U. S. Naval Medical and Dental Supply Depot, U. S. Naval Supply Center, Oakland, California, in support of the West Coast area. Transshipment for ships will be made in accordance with the current operational plan for the particular ship.

(3) The applicable medical stores section (Navy Supply Depot) will be responsible for the receipt of the books and for proper packing prior to overseas shipment, and will certify the dealer's invoice and forward to the paying office. This is to enable prompt payment to suppliers and to prevent loss and damage in transit.

III. Blank Forms:

A. District Publication and Printing Offices:

District Publication and Printing Offices have been

established in all naval districts, with the exception of the Tenth.

These publication and printing offices serve the naval activities within each district by issuance of several Bureau blank forms and by doing printing work not requiring binding. The Tenth Naval District, nondistrict, and fleet activities shall submit their request to the most conveniently located District Publication and Printing Office.

1. *Form Used:* The requisition will be submitted on the NavExos Form 158, Stock Forms and Publications Requisition.

2. Requisitions for blank forms shall be submitted in triplicate to the District Publication and Printing Office.

IV. Purchase Requisitions:

A. Purpose:

Purchase requisitions are requests for procurement of material or services, the procurement of which will usually require purchase action.

1. *Purchase Requisitions Include:*

- a. Annual Requisitions for certain classes of supplies and services which provide authority for continuing local purchase of specified items in unspecified amounts, subject to an estimated expenditure limitation and an annual time limitation.

- b. Individual Purchase Requisitions which provide authority for purchase on a one-time basis of a specific item and quantity.

B. Annual Requisitions:

1. When contracts are desired for known items in an indeterminate amount for the fiscal year, an annual requisition shall be prepared in accordance with the *Bureau of Supplies and Accounts Manual*, paragraphs 23036, 23101, and 23105. A separate annual requisition shall be prepared for each item for which a contract is desired.

2. Bureau approval of annual requisitions is required only in those cases specifically indicated in the *Bureau of*

Supplies and Accounts Manual, paragraph 23026. Distribution of annual requisitions shall be made in accordance with the *Bureau of Supplies and Accounts Manual*, paragraph 23016. Commanding officers shall insure that the Bureau of Medicine and Surgery receives a legible information copy of all annual requisitions approved locally.

C. Individual Purchase Requisitions:

1. Individual purchase requisitions shall be prepared for all items of supplies, services, and equipment requiring the approval of the Bureau of Medicine and Surgery or the technical approval of other bureaus or offices of the Department of the Navy. The *Bureau of Supplies and Accounts Manual*, paragraph 23026, sets forth those items for which technical or cognizant bureau approval is required. In addition to those items listed in the *Bureau of Supplies and Accounts Manual*, Bureau of Medicine and Surgery approval is required for the following specific items:

a. At activities not under Management Control nor Financial responsibility of the Bureau of Medicine and Surgery equipment items which have a unit cost in excess of \$100.00 or when the total cost of similar equipment items exceeds \$100.00, except items available in the Navy Supply System which shall be requested in accordance with BuMed Instructions, 4000 series.

b. At activities under Management Control and Financial responsibility of the Bureau of Medicine and Surgery equipment items which have a unit cost in excess of \$300.00 or when the total cost of similar equipment items exceeds \$300.00, except items available in the Navy Supply System which shall be requested in accordance with BuMed Instructions, 4000 series.

D. Preparation of Purchase Requisitions at Shore Activities:

1. *Form Used:*

NavSandA Form 76 Requisition (original)

NavSandA Form 76a Requisition, Memorandum Copy (yellow)

2. *Numbering*: All requisitions from activities having accounting numbers will be consecutively numbered in appropriate bureau series prefixed by the activity accounting number and suffixed by the last two digits of the fiscal year.

Requisition Number Series Assigned to BuMed

<i>Appropriation</i>	<i>First Series</i>	<i>Second Series</i>
BuMed	3,000 to 3,999	30,000 to 39,999
	<i>Third Series</i>	
	300,000 to 399,999	

Example: U. S. Naval Station, Blank, Virginia

Accounting number—123

The first requisition for fiscal year 1954 will be numbered:

123/3000/54

Following requisitions will be numbered consecutively; i. e.

123/3001/54

123/3002/54

123/3003/54

E. Preparation of Purchase Requisitions, Afloat :

1. *Form Used*:

Requisition Afloat: Purchase Requisition (NavSandA Form 44) will be used for requisitioning material in excess of allowance.

Not in excess material is normally requisitioned on Requisition and Invoice (NavSandA Form 43).

2. *Numbering Requisitions*:

Requisitions from one ship will be consecutively numbered in one series starting with number 1 for each fiscal year. This comprises requisitions prepared by all ship's officers other than medical officers for stores under their control (NavMed-4). The requisitions will be numbered in the following order:

(1) Navy Stock Fund (Exp. A/c 51000)

(2) Navy Stock Fund (Exp. A/c 51500)

(3) Various appropriations (material and services required for immediate use)

(4) Aircraft and Facilities, Navy

(5) Military Personnel, Navy

Requisition numbers are constructed of the following elements:

(a) Hull type and number of vessel.

(b) Serial requisition number.

(c) Last two digits of fiscal year.

Example: U. S. S. *Missouri* BB 63

3. *Preparation*: Purchase requisitions afloat will be prepared in accordance with paragraph 33021 of *Bureau of Supplies and Accounts Manual*.

✓. Priority of Requests:

A. Assignment of Priority and Deadline Delivery Date:

1. Assignment of Priority Indicator:

The priority indicator system is designed to provide a means whereby supply activities may process requests and ship the most important requirements first at such times as the capacity for processing and shipping may become limited. All requests for material, including dispatch or letter requests, will be assigned by the requesting activity a priority indicator which will reflect the relative importance of the requirement in accordance with the delineation of types of need as defined in paragraph B. Except for priority B requisitions for vessels scheduled to be deployed overseas as defined in subparagraph B-2, item c, each priority A or B request will contain a statement showing the justification for the priority assigned in sufficient detail to permit the shipping activity to obtain an appropriate transportation priority for delivery. The justification will be explicit, such as "Priority A, to effect immediate repairs to station power plant." The assignment of any priority will not be based on the deadline delivery date.

2. Assignment of Deadline Delivery Dates:

Realistic deadline delivery dates will be entered on all priority A, B, and C requests and may be entered on priority D requests if necessary. Delivery dates will allow supply activities a maximum of processing and shipping time consistent with the need for the material requested.

3. Relationship Between Priority Indicator and Deadline Delivery Date:

The priority indicator is assigned solely to indicate the relative importance of the requirement in comparison with other requirement and, therefore, has no direct relationship to the deadline delivery date which is assigned for purely operational considerations to meet established schedules. It is possible for priority C and D requests to have an earlier delivery date than higher priority requests when operational requirements dictate. Therefore, such priority C and D requests will be processed before a higher priority request, provided such action does not prevent priority A or B material from being delivered to the consignee before the deadline delivery dates.

B. Priority Indicators:

1. Priority A, Emergency:

Priority A will be assigned to requests for material:

a. necessary to place an inoperative vessel, craft, aircraft, shore station, or an essential installation thereof, in an operative condition in order to carry out its assigned mission or schedule;

b. required for health and general hygiene of such a nature that nonreceipt by the deadline delivery date would cause extreme discomfort or serious personnel hazards.

2. Priority B, Maintenance, Construction, Conversion, Overhaul, and Operation:

Priority B will be assigned to requests for material which is required on or before a realistic deadline delivery date specified and is necessary for:

a. vessel, craft, aircraft, or shore stations to carry out necessary or scheduled alterations, conversions, repairs, or overhaul;

b. the maintenance of new construction schedules for vessel, craft, or aircraft;

c. vessel essential allowance list materials required prior to and incident to scheduled deployment overseas.

3. Priority C, Allowance and Interim:

Priority C will be assigned to requests for material which is required for:

- a. research and development programs, or
- b. new construction of shore facilities, or
- c. filling on board allowances of reserve fleet vessels which have been directed to be activated, or
- d. filling on board allowances of active vessels, craft, and aircraft, or
- e. stock replenishment when current demand exceeds the computed supply, or
- f. establishment of initial stocks of authorized material, including initial outfitting, or
- g. effecting the preservation (including preinactivation overhaul) of vessels of the reserve fleet.

4. *Priority D, Routine:*

Priority D will be assigned to requests for material which is required for:

- a. other necessary replacement of equipment or parts, or
- b. routine stock replenishment, or
- c. filling of on board allowances of inactive or reserve fleet vessels.

INSTRUCTION TEST

Assignment No. 35

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. All activities not authorized to make local procurement of professional medical and dental books shall submit an ----- requisition to BuMed for approval.
2. The purchase requisition which provides authority for purchase on a one-time basis of a specific item and quantity is the ----- requisition.
3. In an emergency, medical and dental items may be requested from naval medical and dental supply facilities by messenger, telephone, letter request or -----.
4. Activities authorized to make local procurement of professional medical and dental books are: Activities under the management control or financial responsibility of BuMed, naval stations listed in OPNAV Instruction 7100.2, research activities and -----.

5. When contracts are desired for known items in an indeterminate amount for the fiscal year, an requisition shall be prepared.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

6. Requisitions for medical and dental material will be submitted to naval medical and dental supply depots on the
1. NavSandA Form 44
2. NavSandA Form 76
3. NavMed Form 4
4. NavMed Form R
7. Purchase requisitions, i. e., annual requisitions, and the individual purchase requisitions, will be prepared by activities *afloat* on
1. NavSandA Form 44
2. NavSandA Form 76
3. NavMed Form 4
4. NavMed Form R
8. Purchase requisitions, i. e., annual requisitions, and individual purchase requisitions, will be prepared by activities *ashore* on
1. NavSandA Form 44
2. NavSandA Form 76
3. NavMed Form 4
4. NavMed Form R
9. Requisitions for blank NavMed forms, BuSandA forms, standard forms, etc., used by the Medical Department will be submitted to the
1. Bureau of Medicine and Surgery
2. district medical officer
3. naval medical and dental supply depot
4. district publications and printing office
10. The priority indicator to be placed on routine replenishment requisitions will be
1. priority C
2. priority D
3. priority A
4. priority B
11. Which of the following listed priority indicators, when used, must show explicit justification?
1. Priority A and C
2. Priority B and D
3. Priority A and B
4. Priority C and D

12. When stock account material is to be requisitioned from the local supply department, the form used to accomplish this is the stub requisition

1. NavSandA Form 129
2. NavSandA Form 127
3. NavSandA Form 44
4. NavSandA Form 57

13. The priority indicator to be assigned to requests for material which is required for stock replenishment when current demand exceeds the computed supply is

1. A
2. B
3. C
4. D

PROPERTY ACCOUNTABILITY, REPORTS AND FORMS

I. General:

In order to avoid unnecessary expenditures of public funds and stores and to comply with laws, regulations, and instructions governing the care and preservation of Government property, accurate and current records of property under the cognizance of the Medical Department shall be kept.

The accounting system for shore stations (other than naval hospitals) and for ships consists principally of records of acquisitions and dispositions of materials and services and of records of appropriation expenditures and obligations.

A. Property Defined:

Property is the term applied to lands, buildings and improvements, equipment, and supplies, which are purchased for, or donated to the Naval Establishment.

B. Physical Classification of Property:

1. Land:

This property class includes all expenditures for, and in connection with, the acquisition of all types of land and water rights, exclusive of improvements thereto.

2. *Buildings and Improvements:*

This property class includes all expenditures for and in connection with the acquisition and/or installation of all types of buildings, structures, utility-distribution systems, sidewalks, roads, surfacing, sea walls, fences; and all expenditures for additions, improvements, and alterations which result in enhancement of the value of these items.

3. *Equipment:*

Equipment consists of property which is adapted to continuing use with minimal impairments of its physical condition and which will ordinarily have an extended period of useful service.

In general only those items of property having all of the following characteristics will be classified as equipment: an expected normal useful life of 1 year or more; a unit cost of approximately \$50.00 or more; and are used to facilitate and expedite the performance of the assigned functions of the activity but are not consumed, unduly altered, nor materially reduced in value by use.

a. Accountability for two distinct categories of equipment is maintained.

(1) *Category I* is plant property class 3, covering items having a unit cost of \$100.00 or more, and certain medical and dental items regardless of unit cost.

(2) *Category II* is comprised of items of minor property having a unit cost of approximately \$50.00 or more, and certain designated items regardless of unit cost that do not meet the criteria for inclusion in the plant account, property class 3 category.

4. *Supplies:*

Supplies consists of property which is ordinarily consumed or expended within a comparatively short period of time; has poor custodial characteristics; is converted in the process of construction, manufacture or use, or is a replacement part for fixed or other equipment.

C. **Services:**

Services consist of useful technical and other labor which includes services of civil and military personnel; services rendered by consultants or others employed on a

gratuitous, per diem, or fee basis; transportation of persons and incidental travel expenses, transportation of things and care of such things while being transported; communication services; rents and utility services; printing and binding services; and other contractual services.

D. Property Responsibility and Accountability:

1. The commanding officer or officer in charge of each activity under the management and technical control of the Bureau; the medical officer, the dental officer, the Medical Service Corps officer, or the senior Medical Department representative, as appropriate, of each other ship or station; and the officer in charge of each other activity having no representative of the Medical Department aboard; shall be held responsible and accountable for all Bureau of Medicine and Surgery cognizant property under his control. Such personnel may, for the purposes of property management, require subordinate Medical Department personnel to supervise, control, and be responsible for all such property in their custody.

2. The dental officer of a ship or station, except at naval hospitals and naval dispensaries commanded by officers of the Medical Corps, shall be in direct charge of and responsible for all supplies and equipment under the control of the Bureau, received for dental use.

3. The dental officer of a ship or station, or the chief of the dental service of a naval hospital or a naval dispensary commanded by an officer of the Medical Corps, or an assistant dental officer under his direction, shall inspect all supplies and equipment received for dental use therein.

E. Unnecessary Expenditure of Property:

1. All persons having custody of property under the cognizance of the Bureau of Medicine and Surgery shall avoid any unnecessary expenditure of such property insofar as it may be within their power to do so, and they shall prevent the same in others. All such persons shall be held responsible for any wasteful or improper expenditure or unauthorized use of any property that they may direct, authorize, or knowingly condone.

2. The degree of responsibility for custody and use of

items classified as supplies or services is, in every respect, equal to that for items classified as equipment.

F. Property Records:

1. Records shall be maintained by each naval medical or dental activity which will promptly disclose the source, date of receipt, book value, current custodial responsibility and date and authority for each disposition of each item of property under the Bureau's cognizance.

2. Approved forms shall be utilized in maintaining all ledgers as property records required under this section. The property records to be maintained by activities are outlined below:

a. *Land Ledger*.—Maintained at BuMed management control activities.

b. *Buildings and Improvements Ledger*.—Maintained at BuMed management control activities.

c. *Equipment Ledger*.—An equipment ledger shall be maintained by all naval medical and/or dental activities ashore or afloat, charged with accountability of Bureau of Medicine and Surgery cognizant property.

d. *Supplies Ledger*.—A supplies ledger shall be maintained by all naval medical and/or dental activities ashore or afloat charged with accountability of Bureau of Medicine and Surgery cognizant property.

e. *Provisions Ledger*.—A provisions ledger shall be maintained at naval hospitals and naval medical centers.

f. *Plant Account Records*.—Records shall be maintained on property record cards of all items carried in the land ledger (Property Class 1), buildings and improvements ledger (Property Class 2), and equipment ledger (Property Class 3) in accordance with instructions contained in the *Bureau of Supplies and Accounts Manual* as modified by current Bureau directives.

g. *Narcotics, Alcohol, Alcoholic Beverages and Precious and Special Dental Metals Records*.—Records shall be maintained by medical and dental activities that will provide information as to receipts, expenditures, and balances on hand of narcotic drugs, alcohol, alcoholic beverages, and precious and special dental metals in store. These records are

supplementary to, but must agree with, the specified accounting records.

G. Property Inventory Records:

1. All ships and stations, except activities to which no Medical Department representative is regularly attached, shall establish (on approved forms) a perpetual record of the inventory for each item of supplies carried in stock and each item of equipment carried in store or in use.

2. Property Location Records:

All ships and stations, except activities to which no Medical Department representative is regularly attached, shall maintain property location records for each operational unit of the Medical and Dental Departments of such activities. The physical location and current inventory count of all nonexpendable items of Medical Department property and such expendable nonconsumable items of Medical Department property as the commanding officer may direct shall be reflected in these records. These records shall be reconciled with the centrally maintained Medical Department property location records.

II. Journal of Receipts and Expenditures of Medical Department Property:

A. General:

1. Forms:

The Journal of Receipts and Expenditures, which is the book of original entry, is a columnar form for recording transactions involving property or services under the cognizance of the Bureau of Medicine and Surgery. It is composed of four sections as follows:

- a. Equipment Section, Receipts (NavMed-1183).
- b. Equipment Section, Expenditures (NavMed-1184).
- c. Supplies and Services Section, Receipts (NavMed-1185).
- d. Supplies and Services Section, Expenditures (NavMed-1186).

2. Scope of Transactions:

All transactions under the cognizance of BuMed, regardless of the fiscal year in which the obligations were in-

curred, shall be recorded in the Journal. Each recording shall be identified by entering the date recorded and the number of the supporting document.

The Journal shall be closed at the end of each quarter, or upon decommissioning, by totaling each column and entering these totals on the appropriate line of the Statement of Receipts and Expenditures of Medical Department Property (NavMed-E).

B. Recording Procedures:

1. Equipment Section, *Receipts* (NavMed-1183); columns 1 through 6:

a. *Recording Receipts*: Receipts of items of property from various sources shall be recorded as follows:

(1) Receipts of property from medical and dental supply depots, as issues from Naval Stock Account, shall be recorded in column 1.

(2) Receipts of property from a field supply activity, as issues from the Naval Stock Account, shall be recorded in column 2.

(3) Receipts of property from commercial sources on public vouchers and receipts from Government sources on a reimbursable basis (except NSA), as a charge against a program allotment granted the activity or an open allotment maintained in the Bureau, shall be recorded in column 3.

(4) Receipts of property received at no charge to a local allotment (TVR) shall be recorded in column 4.

(5) Receipts of property as an allotment charge and nonreimbursable receipts to cover work performed on an approved BuMed Specific Work Request shall be recorded in column 5.

(6) Receipts of equipment reclassified from supplies and equipment gained by physical inventory shall be recorded in column 6, Adjustments.

b. *Corrective Invoices*: Corrective credit or debit invoices shall be recorded in the same manner as other transactions, except that the value of a credit invoice shall be recorded as a red (negative) entry.

c. *Totaling*: At the close of the accounting period (quarter), these columns shall be totaled by adding the

values of the debit recordings and subtracting the values of the credit recordings. The summarized net total of each column will be the amount to be entered on lines 8, 2, 3, 4, 5, 6 and 7, respectively, of the NavMed-E for the same period.

2. Equipment Section, *Expenditures* (NavMed-1184); columns 1, 2, and 3:

a. *Recording Expenditures:*

Expenditure of property by an approved material survey shall be recorded in column 1, Approved Surveys. Note: The "book value" less the "appraised value" is the "survey value" of the property survey.

Expenditure of equipment by transfer to another activity shall be recorded in column 2, Transfer Voucher Issued.

Expenditure of equipment resultant to reclassification of equipment to supplies shall be recorded in column 3, Adjustments.

b. *Corrective Invoices:*

Corrective credit or debit invoices shall be recorded in the same manner as other transactions, except that the value of a credit invoice shall be recorded as a red (negative) entry.

c. *Totaling:*

At the close of the accounting period (quarter), these columns shall be totaled by adding the debit recordings and subtracting the values of the credit recordings. The summarized net total of these columns will be the amount to be entered on lines 13, 10, 11, and 12, respectively, of the NavMed-E for the same period.

3. Supplies and Services Section, *Receipts* (NavMed-1185); columns 1 through 7:

a. *Recording Receipts:*

Receipt of property issued from the NSA by supply depots, as a charge against an allotment granted the activity or an open allotment maintained in the Bureau, shall be recorded in column 1, Medical Stores.

Receipt of property issued from the NSA by a field supply activity, as a charge against a project allotment

granted the activity or an open allotment maintained in the Bureau, shall be recorded in column 2, Naval Stock Account Material.

Receipt of civilian labor as charges to program allotments granted by BuMed shall be recorded in column 3, Civilian Labor.

Receipt of property from commercial sources and reimbursable issues from other Government sources, except NSA, chargeable to a project allotment granted by BuMed, shall be recorded in column 4, Public Vouchers.

Receipts of property received at no charge to the local allotment, except property for specific work request, shall be recorded in column 5, Transfer Vouchers Received.

Receipts of property as an allotment charge and nonreimbursable receipts for performance of work on approved BuMed Specific Work Requests shall be recorded in column 6, BuMed Specific Work Requests.

Receipt of property as a resultant of the reclassification of equipment to supplies, and supplies gained as a resultant of physical inventory shall be recorded in column 7, Adjustments.

b. *Corrective Invoices:*

Corrective credit or debit invoices shall be recorded in the same manner as other transactions, except that the value of a credit invoice shall be recorded as a red (negative) entry.

c. *Totaling:*

At the close of the accounting period (quarter), these columns shall be totaled by adding the values of the debit recordings and subtracting the values of the credit recordings. The summarized net totals of these columns will be the amounts to be entered on lines, 18, 19, 20, 21, 22, 23, and 24, respectively, of the NavMed-E for the same period.

4. Supplies and Services Section, *Expenditures* (NavMed-1186); columns 1 thru 27:

a. *Recording Expenditures:*

Expenditures of supplies, labor, and services for

the treatment and care of patients shall be recorded in columns 1, 2, and 3, respectively, Care of the Sick.

Expenditures of supplies, labor, and services for the operation and maintenance of activities under the management control or financial responsibility of BuMed shall be recorded in columns 4, 5, and 6, BuMed Management Expenses.

Expenditures of supplies and services to cover work performed on approved BuMed Specific Work Requests shall be recorded in column 7, BuMed Specific Work Requests.

Expenditures of supplies by an approved material survey shall be recorded in column 8, Approved Surveys.

Expenditures of supplies, labor, and services directly for research projects shall be recorded in columns 9, 10, and 11, Research:—Direct.

Expenditures of supplies, labor, and services for research, which are not readily identified with a specific project, shall be recorded in columns 12, 13, and 14, Research:—Indirect.

Expenditures of supplies and services for instruction shall be recorded in columns 15 and 16, Instructions. (Used only by activities authorized to obligate and expend funds under appropriation subhead .21, Education and Training.)

Expenditures of supplies and services for care of the dead shall be recorded in columns 17 and 18, Care of the Dead.

Columns 19 thru 24—Leave blank.

Expenditures of supplied and services by an approved Transfer Voucher Issued shall be recorded in columns 25 and 26, TVI.

Expenditures of supplies reclassified as equipment, and supplies lost as a resultant of physical inventory shall be recorded in column 27, Adjustments.

b. Corrective Invoices:

Corrective credit or debit invoices shall be recorded in the same manner as other transactions, except that the value of a credit invoice shall be recorded as a red (negative) entry.

c. Totaling:

At the close of the accounting period (quarter),

these columns shall be totaled by adding the values of the debit recordings and subtracting the values of the credit recordings.

The summarized net totals shall be the amounts to be entered on lines 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 38, and 39, respectively, of the NavMed-E for the same period.

III. Property Accountability—Equipment:

A. Physical Inventory:

1. Equipment in Use:

A monthly physical inventory of all equipment in use shall be taken and certified as to its accuracy by all individuals who have actual physical custody of such property.

2. All Equipment:

A complete inventory of all equipment shall be held at least annually. The quantity found to be on hand resultant to inventory shall be verified with the quantities and location shown in the equipment ledger and the plant account records. When equipment items are found to be missing, a property survey shall be held immediately. When equipment items are discovered which do not appear in the equipment ledger, adjustment shall be made in accordance with current Bureau Instructions.

B. Material to be Reported as Equipment, Plant Property Class 3, and Material to be Carried and Accounted for as Equipment:

1. General:

a. The instructions set forth in the *Navy Comptroller Manual* regarding material to be reported and accounted for as Capital Equipment, Plant Property Class 3, shall be observed by all Medical Department activities and facilities.

(1) The criteria set forth in the *Manual of the Medical Department* in Article 25-3, subparagraph (3) shall be used as a guide in determining which items, in addition to those listed below in subparagraph (2), shall be carried and accounted for as *minor equipment* in the Equipment Ledgers.

(2) The following items shall be carried as minor equipment regardless of cost: office and classroom furniture, such as desks, chairs, tables, filing cabinets, bookcases, stands, clothestrees, lockers; quarters furniture, BOQ furniture, barracks furniture and professional books.

(3) The activity shall use discretion in determining borderline items of minor equipment with a view of maintaining uniformity rather than exceptions.

b. Local identification for control purposes shall be established. Subsequent acquisitions of minor property shall not be marked or tagged with plant-property identification media. For purposes of uniformity, it is suggested that minor items be designated: M-100, M-101, M-102, etc., the number to be affixed by tag, or painted on as may be appropriate, to the item being marked.

c. Upon acquisition or disposition of plant property class 3, furnish the Plant Account Officer (Fiscal Office) with sufficient data to enable him to modify the plant account accordingly. This is usually accomplished on a locally prepared form showing in case of receipt the date and from whom received, item description, cost, etc.; and in case of disposition the date and means of disposal, item description, etc.

C. Issue of Equipment:

Equipment shall be issued and returned to store for reissue, or for survey, only by authority of a duly approved Equipment Voucher, NavMed-11, in each instance. Each equipment voucher shall be signed by the head of department or officer in charge of the activity receiving the material at the time the issue or return is made.

Issued: When a new or additional item is required.

Surveyed: When an item is lost, worn beyond repair, etc.

Surveyed and Replaced: This action was intended to be used when the item surveyed required replacement. However, since there are two actions involved, a request for survey and a request for issue, a separate NavMed-11 should be prepared for each action.

Placed in Storage: Action to be taken when an item is no longer needed and it is fit for reissue.

D. Equipment Ledger:

1. An equipment ledger of the approved sheet or card type shall be maintained by all naval medical and/or dental activities ashore or afloat, charged with accountability of Bureau of Medicine and Surgery cognizant property. The equipment ledger shall be classified and arranged in the general categories, parts, classes and stock numbers, according to current instructions.

2. A record of all property classified as equipment, in accordance with instructions contained in *BuMed Manual*, shall be maintained in the equipment ledger.

3. Changes may be recorded in the equipment ledger only upon authority of a properly approved acquisition or disposition document. Adjustments to the equipment ledger required by reason of reclassification may be recorded upon authority of a properly approved adjustment voucher.

4. The accountability for equipment items may only be terminated by a properly approved transfer voucher or by an approved survey. It is to be noted that the issue of equipment from the storeroom for use by a department *transfers* the primary *custodial* responsibility to the officer or person responsible for the department in which such equipment is to be used.

E. Equipment Ledger, Maintenance of:

1. General:

The equipment ledger may be maintained on either the NavMed-W Medical Stores Ledger Sheet or by the Cardex system (NavMed 801, 802, 803, 804, and 805).

2. Arrangement:

The equipment ledger shall be arranged to provide a separate section for items in Category I, "Plant Property Class 3," and a separate section for Category II, "Minor Equipment." Each section shall have a control sheet to reflect the dollar value of the section. The total of the Plant Property Class 3 and Minor Equipment sections should equal the value of the equipment ledgers as recorded on the "Equipment Ledger Master Control Sheet."

a. An equipment ledger sheet is maintained for each item or lot of identical items (Stock Number).

b. A control sheet is maintained for each class and a control sheet is maintained on the class control sheets within each part (Part I and Part II) within each Category. A master control sheet shall control the entire ledger.

3. *Material Ordered:*

When a requisition or order is for additional items now stocked, or a restocking of items previously stocked; the recording of the placing of the requisition or order in the "Ordered" section of the item ledger sheet is all that is required.

4. *Recording Receipt of Material:*

a. Upon receipt of the material and all related papers (Receiving Record, etc.), the following will be carried out:

After the journal entry, locate the ledger sheet by reference to the stock number on the receiving record. Under "Ordered" strike out the quantity ordered to show that the order is no longer outstanding. If any of the items were back ordered, enter the quantity back ordered under column "Balance Due." Enter the location of the items on the reverse of the respective ledger sheets.

b. *Posting:* Receipts of equipment shall be posted to the equipment ledger from data contained in the voucher evidencing payment, settlement, or substantiating such voucher, for equipment received.

(1) Upon receipt of the substantiating settlement voucher evidencing payment and supporting receiving records carry out the following:

Locate the ledger sheet for the item received by reference to the stock number.

Enter the receipt:

On the NavMed-W in the "Receipts" section enter the date, voucher number, from whom received (vendor in code), quantity received, and the total value of the receipt.

Note: The value at which equipment is to be recorded is the invoice value net of any discount allowed, if earned. If an item is received at no cost, it will be given an appraised value.

In the "Balance on Hand" section, increase the quantity recorded on the preceding line by the quantity received and enter the sum in the "Total Quantity" column. No entry is made in the "Unit Price" column. Enter in "Value of Total on Hand" column the sum of the value shown on the preceding line and the value of the receipt.

Posting Receipt on the Control Sheets:

The receipt is also recorded in the applicable class, part, category, and master control sheets. This is accomplished as follows:

Record in the "Receipts" section the date, voucher number, from whom received (code), and invoice value applicable to the control sheet. No entry is made in the "Quantity" column for quantity received because this is a control sheet for value only.

Record in "Balance on Hand" section the sum of the value shown on the preceding line in the "Total Value" column and the value of the receipt applicable to the control sheet.

5. Recording Expenditures:

The accountability for equipment items can only be terminated by a *receipted* transfer voucher issued, or by an *approved* property survey. It is to be noted that the issue of equipment from the storeroom for use by a department transfers the primary custodial responsibility to the officer or person responsible for the department in which such equipment is to be used.

a. Expenditure Documents:

(1) *Material Issued on TVI*: When equipment is issued by TVI, the location record on the reverse of the NavMed-W item ledger sheet is modified to show the quantity of the item transferred by TVI.

(a) Receipted Transfer Voucher Issued:

At the time that an authorized person signs the TVI (at time of shipment), the signed copy of the TVI becomes the authority to expend the item or items and transfer value (book value) from the equipment ledger. This is accomplished as follows:

(b) Recording the Expenditure: (After Journal entry).

In the "Expended" section enter the date, voucher number (if the expended section has no columns for date and voucher number, enter date and voucher number under the "Receipts" section), quantity expended in the "Survey, Transfer, Inv. Adj.," column and the transfer value in the "Value" column.

In the "Balance on Hand" section reduce the quantity as shown on the preceding line by the quantity expended and enter the difference in the "Total Quantity" column, and reduce the value shown on the preceding line by the transfer value and enter the difference in the "Total Value" column.

Remove the transfer notation of the item from the location record of the reverse on the item NavMed-W.

(2) *Property Survey*: When a property survey is prepared make an appropriate entry, *in pencil*, on the reverse of the item NavMed-W to indicate the survey number and the quantity awaiting survey.

(a) Survey Value: An approved property survey shows two values for each item thereon. It shows the book value and the appraised value from which the survey value can be determined. To determine the survey value of an item, subtract the appraised value from the book value and the difference is the survey value.

If there is no appraised value, then the book value is the survey value. The approved property survey is authority to expend the survey value from the ledger.

(b) Authority to Expend the Item: The recommendation of the survey officer or board, as approved, determines if the approved property survey is or is not authority to expend the item from the ledger. If the approved recommendation is for transfer of the item, then the approved property survey is not authority to expend the item from the ledger but is the authority to expend the survey value from the ledger. The authority to expend the item will be the receipted TVI as discussed under (1) above.

(c) Recording Expenditure on Item NavMed-W: The expenditure shall be accomplished as follows:

Locate the ledger sheet for the items on the approved property survey.

In the "Expended" section enter the date and survey number. If no space is provided for date and voucher number under the "Expended" section, enter the date and voucher number under the "Receipts" section. If the survey is authority to expend the item, enter the quantity in the "Survey, Transfer, Inv. Adj." column and enter the survey value in the "Value" column.

In the "Balance on Hand" section if the survey is authority to expend the item, reduce the quantity as shown on the preceding line by the quantity authorized to be expended by the survey and enter the difference in the "Total Quantity" column. Reduce the value as shown on the preceding line by the value authorized to be expended by survey and enter the difference in the "Total Value" column.

If the survey was authority to expend the item, reduce by the quantity authorized, the quantity shown "Awaiting Survey" on the reverse of the NavMed-W.

(d) Recording Expenditure on Control Sheets: The expenditure is also recorded on the applicable class, part, category, and master control sheets. This can be accomplished as follows:

Record in the "Expended" section the date and survey number and value of the survey applicable to the control sheet. Record the date and voucher number in the "Receipts" section if there is not space for same in the "Expended" section.

Record in the "Balance on Hand" section the difference between the value shown on the preceding line and the value of expenditure by survey applicable to the control sheet in the "Total Value" column.

6. *Adjustments, Corrections of Erroneous Entries:*

There will be, from time to time, need for adjustments to the equipment ledger.

a. Reclassification of Equipment as Supplies:

Prepare an Inventory Adjustment Voucher (IAV) on NavSandA Form 127 for the book value of all equipment reclassified as supplies.

Note: The IAV will be numbered in the IAV series and it will be prepared from the "Commanding Officer (Activity)" to the "Commanding Officer (Activity)." Each item to be reclassified should be listed and extended in stock number sequence by classes. Subtotal each class, and leave a double space between classes. Immediately below the last class subtotal place the Grand Total for the IAV.

Record the value of the IAV as an expenditure in the Equipment Section of the Journal of Receipts and Expenditures, NavMed 1184, under column (3) "Adjustments" and report this amount on line 12 on NavMed-E making suitable explanation under "Remarks."

Record the value of the IAV as a receipt in the Supplies and Services Section of the R&E Journal, NavMed 1185, under column (7) "Adjustments" and report this amount on line 24 on the NavMed-E.

Posting the Ledger: The Master Control Sheet and class recap sheets shall be adjusted in accordance with the results of the reclassification. Individual ledger sheets comprising the total book value of the equipment reclassified as supplies shall be removed from the equipment ledger and inserted in the supply ledger.

Equipment in Use Which has been Reclassified as Supplies: Issue on Issue Voucher, NavMed-R, immediately and this amount shall be recorded as an expenditure in the Supplies and Services Section of the R&E Journal, NavMed 1186, under column (27) "Adjustments."

b. Reclassification of Supplies to Equipment:

Prepare an IAV, NavSandA 127 for the book value of all supplies reclassified as equipment.

Items in Use which were expended from the ledgers shall be recorded as a "Gain by Inventory" and reflected on line 7 (Adjustments) on NavMed-E.

Items in the storeroom shall be recorded in the supplies ledger as an expenditure and reflected on line 39

(Adjustments) on NavMed-E and in the equipment ledger as a receipt and reflected on line 7 (Adjustments) of NavMed-E with a proper notation under "Remarks."

c. Debit and Credit Invoices, NavSandA 127:

Occasionally material is received from the Supply Facility and invoiced on a NavSandA 127 and recorded as a receipt in the ledgers, when sometime later an adjustment invoice is received due to error in preparation of the original invoice from the Medical Supply Facility. These adjustments are of two types: A *debit invoice due to an under charge*, and a *credit invoice due to an overcharge*.

(1) *Debit Invoice*: Upon receipt of a debit invoice (if the invoice on which the debit was made has been posted), the additional value will be taken up in the same manner as the original receipt on the applicable item ledger sheet and control sheets. The two entries, the original and adjusting, should be cross referenced.

(2) *Credit Invoice*: Upon receipt of a credit invoice (if the original invoice on which the credit was made has been posted), the reduced value will be recorded in the receipt section in *red* on the applicable item ledger sheet and control sheets. The "Balance on Hand" will be recorded as an expenditure.

IV. Property Accountability—Supplies:

A. Supplies Defined:

"Supplies" consists of property which does not meet the criteria for equipment; is ordinarily consumed or expended within a comparatively short period of time; has poor custodial characteristics; is converted in the process of construction, manufacture or use, or is a replacement part for fixed or other equipment.

1. *Controlled Stores*:

Controlled stores are items of supplies which are not readily consumed by usage but perform a repeated number of operations; such as surgical instruments.

Issue and expenditure of controlled stores should be made in the usual manner for supplies. However, they will not be immediately consumed and replacement will not be required immediately.

For stock control purposes these items will be considered as on hand until they are worn out even though they have been expended from the supply ledger.

2. *Locked Storage Items:*

All quantities of narcotic drugs, alcohol, alcoholic beverages, and precious and special dental metals not required for immediate use shall be maintained in locked storage under the direct custody of an officer.

Records shall be maintained by medical and dental activities that will provide information as to receipts, expenditures, and balances on hand of narcotic drugs, alcohol, alcoholic beverages, and precious and special dental metals in store. These records are supplementary to, but must agree with, the specified accounting records.

Small quantities of narcotic drugs, alcohol, and alcoholic beverages required for dispensing purposes shall be properly recorded when expended and kept in locked storage when not in use. The pharmacy, wards, and other operational units of the activity authorized to have custody of and to dispense narcotics shall also maintain detailed records of receipts, expenditures, and balances on hand.

B. *Physical Inventory:*

1. *All Supplies:*

A physical inventory of all unissued supplies shall be completed quarterly, unless otherwise authorized by the Bureau, and the supplies ledger shall be reconciled with the physical findings of the inventory. Adjustments shall be made by inventory adjustment voucher prepared, approved, and recorded in accordance with current instructions.

2. *Narcotics, Alcohol, Alcoholic Beverages, and Precious and Special Dental Metals:*

A physical inventory shall be taken monthly of all narcotics, alcohol, alcoholic beverages, and precious and special dental metals by the medical or dental activity repre-

sentative responsible for their custody. The results of this inventory shall be verified by sight by a board of three officers appointed for that purpose, except that in small ships and small shore stations, where three officers would not be available, one Medical Department representative and one officer may constitute the board. The board for inventory of dental metals shall consist of dental officers whenever practicable.

Inventory of narcotic drugs, alcohol, and alcoholic beverages in the pharmacy shall be conducted in the same manner as the inventory of bulk stocks in the storeroom.

All prescribed accounting records and prescriptions for narcotics, alcohol, and alcoholic beverages for the prescribed inventory period shall be checked for compliance with regulations, particularly as to dating, proper preparation, and signature by an authorized Medical Department representative.

The inventory board shall carefully inspect the original seals on the closures of the containers of bulk stocks and unissued items.

The inventory board shall also inspect the security of the places where such bulk stock or unissued items are stored.

a. *Loss of Narcotics:* Losses, thefts, or irreconcilable differences between physical inventory findings and the narcotic accounting records shall be reported immediately to the Bureau through official channels and simultaneously a copy of this report shall be supplied to the supervisor of the nearest U. S. Treasury Bureau of Narcotics district office.

C. Issue of Supplies:

The accountability for items of unissued supplies can only be terminated by a receipted Transfer Voucher Issued, an approved Property Survey, a receipted Issue Voucher, or approved Inventory Adjustment Voucher.

Property responsibility and custody are ended when supplies are shipped, as the carrier is presumed to act as an agent of the receiving activity rather than the shipping activity. An approved transfer voucher at time of shipment

or transfer shall be used as authority to remove property from ledgers. Receipts for material by responsible representatives of the carrier, activity, or Government department shall be obtained by the issuing activity to complete the activity's files.

D. Supply Ledger:

A supply ledger of the approved sheet (NavMed-W Medical Stores Ledger Sheet) or card type (NavMed 801, 802, 803, 804, 805), shall be maintained by all Medical and/or Dental Departments of naval activities ashore and afloat charged with the accountability of Medical Department property.

E. Supply Ledger, Maintenance of:

Only the NavMed-W ledger will be discussed here. This form is designed so that it may be utilized as a ledger and for stock control.

A supplies ledger sheet is maintained for each item or lot of identical items (Stock Number).

A control sheet is maintained for each class and a control sheet is maintained on the class control sheets within each part. A master control sheet shall control the entire ledger.

Special purchases of supplies which are not stocked in the storeroom and are issued upon receipt shall be recorded on a special ledger sheet. Such ledger sheets shall be maintained for each class of supplies under which material is received.

1. *Material Ordered:*

a. Existing Stock Items:

When a request document is for additional items now stocked or restocking of items previously stocked, the recording of the placing of the requisition or order is all that is required.

Locate the ledger sheet by reference to the stock number on the request document.

Enter in the column under the "Ordered" section the date the requisition or order was placed; the requisition or order number; the vendor's code; and the quantity ordered.

2. *Recording Receipt of Material:*

a. Upon receipt of the material and after the Receiving Record has been completed, the following will be carried out:

Locate the ledger sheet by reference to the stock number on the Receiving Record. Under the "Ordered" section strike out the quantity ordered to show that the order is no longer outstanding. If any of the items were back ordered, enter the quantity back ordered under the column "Balance Due."

b. Substantiating Settlement Voucher:

After the material has been received, accepted and the substantiating settlement voucher has been received, the receipt may be entered in the R&E Journal and posted to the ledger.

c. Posting to Item Ledger Sheet:

"Receipt Section"

Enter the date in "Date" column;

Enter voucher number in "Voucher" column;

Enter vendor's code in "Activity" column;

Enter the quantity of the item received in the "Quantity" column.

Enter the unit price in "Unit Price" column;

Enter the total value of the receipt in the "Value" column.

"Balance on Hand Section"

Enter the sum of the quantity received plus any quantity as shown on the preceding line in the "Total Quantity" column.

Enter the sum of the value received plus any value shown on the preceding line in the "Total Value" column;

Unit Price Column: All issue of *supplies* shall be accounted for on the average unit price basis. As material is received, the quantity and the total value of the receipt shall be added to the previous quantity and total value on hand and a new unit price then calculated. *Total Value* divided by *Total Quantity* equals *Unit Price*.

d. Posting to Control Sheets:

"Receipt Section" (Class, Part, and Master)

Enter date in "Date" column;
Enter voucher number in "Voucher" column;
Enter activity from whom received (in code or name) in the "Activity" column;

Enter the invoice value applicable to the control sheet in the "Value" column.

"Balance on Hand Section"

Enter the sum of the invoice value applicable to the control sheet and the value shown on the preceding line in the "Total Value" column.

3. *Recording Expenditures:*

a. Transfer Voucher Issued (TVI):

When supplies are transferred on a TVI, the material is expended from the supply ledger upon receipt of a properly receipted copy of the approved TVI from the shipping or transferring agency; or receipted copies of the TVI from the activity receiving the material when direct delivery is made.

The receipt of a receipted TVI is authority to make an R&E Journal entry and to expend the items from the supply ledger.

(1) Recording TVI on Item Ledger Sheets:

"Receipt Section"

Enter the date in the "Date" column;

Enter the TVI number in the "Voucher Number" column;

Enter the activity to which the material was transferred in the "Activity" column.

"Expended Section"

Enter the quantity expended by the TVI in the "Survey, Transfer, Inv. Adj." column.

Enter the value of the expenditure in the "Value" column.

"Balance on Hand Section"

Reduce the quantity as indicated on the preceding line by the quantity expended by TVI and enter the difference in the "Total Quantity" column.

Reduce the value of the "Total Value" column by the value expended by TVI.

"Unit Price" column—it is to be noted that the value of this transfer may be at a unit cost different from that at which the item is now being carried on the books and the recording of this transfer will change the unit cost of those remaining on the ledger. If this happens, establish a new unit cost at the time of expenditure.

(2) Recording the TVI on Control Sheets:

The expenditure is also recorded to the applicable class, part, and master control sheets. This can be accomplished as follows:

"Receipt Section"

"Date" and "Voucher Number" columns; enter the date and voucher number (TVI No.) in these columns.

"Activity" column; enter the activity to which the material was transferred.

"Expended Section"

"Value" column—enter the value of expenditure by TVI applicable to the control sheet in this column.

"Balance on Hand Section"

Reduce the value of the "Total Value" column by the amount of the expenditure by TVI applicable to the control sheets.

b. Survey:

When it is determined that certain supplies are to be surveyed, a notation should be made on the reverse of the item NavMed-W ledger sheet in caption "Awaiting Survey." Enter the quantity awaiting survey and when the survey is prepared, also add the survey number. A pencil notation should also be made on the upper margin of the front of the NavMed-W ledger sheet. After the approved survey is posted, the pencil notation is to be removed.

The receipt of an approved survey is authority to make an entry in the R&E Journal and to expend the item or items and value from the ledger. Usually in the case of supplies being surveyed, the items will not be assigned an appraised value and the approved survey will be authority to expend the items and value from the ledger. If an item of supply is given an appraised value, the approved survey

is authority to remove the survey value only from the ledger. *Book Value* minus *Appraised Value* equals *Survey Value*.

(1) Recording Expenditure by Survey on Item Ledger Sheet:

"Receipt Section"

Enter the date and voucher number (survey number) in the "Date" and "Voucher Number" columns.

"Expended Section"

In the "Survey, Transfer, Inv. Adj." column, if the survey is the authority to expend the items, enter the quantity expended.

Enter the value of the expenditure by survey in the "Value" column.

"Balance on Hand Section"

"Total Quantity" column—if the survey is the authority to expend the item, reduce the quantity indicated on the preceding line by the quantity expended by survey.

"Total Value" column—reduce the value indicated on the preceding line by the value of expenditure by survey.

"Unit Price" column—adjust unit cost if required.

(2) Recording Survey on Control Sheets:

Post the survey to the applicable control sheets recording the expenditure of value only.

C. Approved Issue Voucher; NavMed Form R:

(1) Locked Storage Items:

Approved NavMed Form R is submitted in triplicate by the pharmacy or other department. These NavMed-R's are assigned serial numbers in the P&A office.

NavMed-R's for locked storage items will be numbered in separate series by fiscal year.

"AR" series for Alcohol.

"NR" series for Narcotics.

When the material is issued, the quantity issued will be expended from the locked storage officer's stock control records.

One signed copy of the issue voucher will be

retained by the lock storage officer to substantiate the expenditure from his records.

One signed copy will go to the storeroom to substantiate the expenditure from the supply ledger.

One signed copy will go to the pharmacy to substantiate the receipt in the pharmacy records.

Recording Expenditure of Locked Storage Items from Supply Ledger: The NavMed-R's for these items will be priced and expended from the Supply Ledger immediately after issue.

Expenditure from Item Ledger Sheet:

"Receipt Section"

Enter the date and voucher number (AR 1-54, AR 2-54-NR 1-54 etc.) in the "Date" and "Voucher Number" column.

"Expended Section"

Enter quantity issued in the "Use" column.

Enter value of the quantity issued in the "Value" column.

"Balance on Hand Section"

Reduce the quantity of the "Total Quantity" column by the quantity expended by the NavMed-R.

Reduce the value of the "Total Value" column by the value of the expenditure.

Enter average unit cost in the "Unit Price" column.

Expenditure from Control Sheets:

"Receipt Section"

Enter the date and voucher number in the "Date" and "Voucher Number" column.

"Expended Section"

Enter the value applicable to the control sheet in the "Value" column.

"Balance on Hand Section"

Reduce the value of the "Total Value" column applicable to the control sheets by the value of the expenditure.

(2) Other than Locked Storage Items:

(a) *General:* NavMed-R's are submitted to the

storeroom in duplicate for all supplies other than locked storage items.

A serial number is assigned to each issue voucher by the P&A office beginning a new series with each fiscal year.

The material is issued and receipted for by a representative of the department which requested the material.

The original, signed copy of the issue voucher is retained by the P&A office to substantiate the expenditure from the supply ledger.

The copy is returned to the department with the material issued.

(b) *Expenditure:*

Step I:

When an issue is made on a NavMed-R, the issue is recorded on the Tally Record on the reverse of the respective item NavMed-W ledger sheet.

Step II:

At the end of the month/quarter, the issues for the period as indicated by the tally record are listed on the Consolidated Form R (CR)

Step III:

The total issue for each item, as indicated by the Consolidated Form R, will be expended from the face of the item ledger sheet as one expenditure.

The voucher number will be CR1-54, CR2-54, etc., or CR 1st Quarter, CR 2nd Quarter.

Upon completion of the expenditure for the month and/or quarter, the total issues to "Use" on the item for the period should be entered in the appropriate section under "Usage Data."

The Consolidated Form R should be prepared by classes in stock number order. A total struck for each class and at the end of the "CR," a Grand Total of expenditures for all classes should be struck.

After the completion of the posting, the CR should be filed with the substantiating NavMed-R's for the period.

F. General Notes Concerning Supplies:

The Armed Services Catalog of Medical Material lists certain precautions in the handling, care and use of certain items of supplies. Regulations have been established for the custody, issue and accounting of alcohol, narcotics, poisons, and allied materials.

Certain biologicals require special storage, as yellow fever vaccine; other types may not be frozen. Practically all biologicals have potency dates established. That date is usually stamped on all containers. These should be checked frequently.

Highly inflammable materials such as ether, acetone, and ethyl chloride, require special storage facilities to aid in preventing fires, and ease of disposal in case of fire aboard ship.

Corrosive acids such as nitric, hydrochloric, and sulfuric should be stored in special lead-lined containers.

Items made of rubber, such as rubber tubing, gloves, and ice bags, should receive special attention. Items of this nature, if kept stored in storerooms with high temperatures, deteriorate very rapidly.

There are drugs other than biologicals which have potency dates established. These should be observed carefully.

Care should be exercised in the handling of supplies. Many containers are easily broken, causing not only the loss of contents, but may ruin other supplies stored nearby.

Supplies should be rotated, the rule governing this is "oldest stock used first."

V. Property Survey:

A. Definition:

A survey is the procedure required by articles 1947 through 1953, *Navy Regulations*, when naval property must be:

1. Condemned as a result of damage or deterioration;
2. Appraised as a result of loss of utility; or

3. Acknowledged as nonexistent as a result of loss or theft, necessitating the expenditure of the accountable material from the records of the holding activity.

B. Purpose:

The purpose of a survey is to provide a record for:

1. An administrative review of the condition of the material, the cause of the condition, the responsibility therefor, and the recommendation for disposition.

2. An authorization to expend the material from the records on which carried.

C. Types of Surveys:

Surveys are of two types, formal and informal.

1. A formal survey shall be made by either a commissioned officer or a board of three officers, one of whom, and as many as practicable, will be commissioned officers, appointed in either instance by the commanding officer. If sufficient eligible officers are not available to the commanding officer, he will forward the survey request for action to his immediate superior in command, or in the absence of his immediate superior in command, to the senior officer present.

The following officers are not to serve on a survey board:

a. The commanding officer.

b. The officer on whose records the material being surveyed is carried.

c. The officer charged with the custody of the material being surveyed.

2. An informal survey is to be made by the head of the department having custody of the material to be surveyed, except at hospitals where surveys shall be made by the finance officer, or in case of provisions by the food service officer.

D. Formal Survey—When Required:

A formal survey will be required for Bureau cognizant material falling within the following categories:

1. Land.

2. Buildings and improvements.

3. Equipment, when the book value of a single piece of equipment exceeds \$100.

4. When specifically directed by the commanding officer, if the circumstances are considered to warrant such action.

E. Informal Survey—When Required:

An informal survey is made in all cases when a formal survey is not required nor directed by the commanding officer.

F. Phases of Survey Procedure:

The survey procedure consists of the following phases:

1. Request for survey.
2. Action by the commanding officer on the request for survey.
3. Action of the survey board or officer.
4. Preparation of the survey report.
5. Action by the reviewing officer, *normally the commanding officer*, on the survey report.
6. Expenditure of material from the records on which carried *when* recommended by the survey report and approved by the reviewing officer.

G. Request for Survey:

The survey request may be originated by any department, division, or section head or by a designated subordinate as prescribed in local regulations.

H. Action by the Commanding Officer:

Upon receipt of the survey request, the commanding officer or his representative shall determine whether a formal or an informal survey is appropriate. This decision shall be entered on the original and copies of the survey request.

I. Preparation of the Survey Report:

1. The surveying officer, board, or head of department shall make a thorough inspection of the material being surveyed to determine its condition at the time of survey; or, if missing, a thorough examination of the circumstances attending the loss, and shall fix the cause and responsibility therefor, or, when responsibility cannot be fixed, shall make a statement showing clearly why such cannot be done. A full report shall be made on Survey Request, Report and Expenditure, NavSandA 154, in the report section including

the findings as to condition, cause and, responsibility with a recommendation as to disposition, replacement, or continuance in service.

J. Action by the Reviewing Officer:

After action has been completed by the surveying officer, board, or head of department, the survey report shall be submitted for review to the commanding officer, or to the officer ordering the survey if the survey was ordered by higher authority. When the reviewing officer does not approve the action of the surveying officer, board, or head of department, he shall cause another survey to be held on the material. In all cases the second survey shall be formal. If the reviewing officer does not approve the findings of the second survey, the matter shall then be referred to the bureau or office having cognizance over the material.

K. Final Approval of Surveys:

Final approval of surveys shall be accomplished by the reviewing officer except as noted in subarticle J above.

VI. Transfers:

A. Equipment and Supplies:

Property under the cognizance of the Bureau of Medicine and Surgery shall not be loaned to any state, organization, or private individual except as provided by *Navy Regulations* or other competent authority.

Property may be loaned or transferred to other activities or naval vessels at the discretion of the commanding officer when such loans or transfers will serve a useful purpose.

B. Form Used:

When the transfer is authorized, it shall be accomplished on Receipt/Expenditure Invoice, NavSandA Form 127.

C. Preparation of the TVI; NavSandA Form 127:

1. Enter the assigned TVI number opposite "Invoice Number." TVI's are numbered serially by fiscal years, i. e., TVI 1-54, TVI 2-54, etc.

2. Enter in the "From" line, Commanding Officer, and name and location of ship or station.

3. Enter the date of preparation in the "Date" block.

4. Enter on the "Authority" line the authority for the transfer.

5. The items will be numbered consecutively in the "Item Number" column.

6. Enter the stock number, in stock number order, opposite the respective item number in the "Standard Stock Catalog or Class Number" column.

7. Enter in the "Description of Article" column, opposite the respective stock number, the item description as carried in the property ledger.

8. Enter the quantity to be transferred in the "Quantity Delivered" column, opposite the respective item.

9. Enter the unit price in the "Unit Price" column. The unit price will be the book value of the item or appraised value when appraised by a board of survey.

10. Enter the extension, unit price times quantity, in the "Extension" column.

11. Double space between items and sub-total each class.

12. When all items to be transferred have been listed, strike a total of the extensions and enter opposite "Total."

13. If more than one page is required, each page should be numbered, such as—Page 1 of 4, Page 2 of 4, Page 3 of 4, and Page 4 of 4. In this case page totals should be struck and cumulative page totals struck and carried forward, and a "Total" struck for all pages.

14. If the material is to be transferred at no exchange of funds, a statement to that effect should be placed on the voucher.

VII. Transfer of Property Custody:

A. Whenever the Commanding Officer, officer in charge, or Medical Department representative having custody of material under the management or technical control of the Bureau of Medicine and Surgery is relieved of command or duty, the transfer of responsibility and accountability to his relief or other designated person shall be made by exchanging of receipts on NavMed-D, Transfer of Property Custody.

B. When the medical or dental property of a ship or station is transferred to a relieving medical or dental activity repre-

sentative, inventory of narcotics, precious and special dental metals, alcohol, and alcoholic beverages is required.

C. A spot-check inventory of a random selection of other items shall be made as an indication of the reliability of the property records. Gross discrepancies discovered through spot-checks shall be considered sufficient cause to conduct a complete inventory of all items. A property survey shall be held for all items found to be missing.

D. Distribution of the Completed NavMed-D:

Original: To Medical Department files.

Duplicate: To officer or corpsman transferring property custody.

Triplicate: To officer or corpsmen receiving property custody.

VIII. Levels of Supply for Medical and Dental Stores:

A. Perpetual Inventory Records:

1. There shall be maintained in all BuMed managed activities and in all Medical and Dental Departments of ships and stations a perpetual record of the inventory for each item of medical and dental supplies carried in store for use and for each item of medical and dental equipment carried in store or in use. This record shall be maintained on appropriate forms and in such manner as prescribed by current directives.

2. In order to insure proper stock control procedures and to prevent over and under stocking of material, it is mandatory that certain data be entered on the record. This data is in addition to the record of receipts, expenditures, and balances reflected on the record. It is required in calculating requirements, submitting requisitions, and prevention of depleting stocks. This data is described as follows:

a. *Usage Rate:* A usage rate shall be established for all items which will be consumed in use or generally require replacement after less than one (1) year of use.

The usage rate for such an item shall be established in terms of:

(1) "Quantity per month to supply 100 patients" at *hospitals* and *hospital ships*.

(2) "Quantity per month to supply 1,000 population" at other *ships* and *stations*.

(3) "Quantity per month to supply one dental officer" at activities in which separate records are maintained for material used by dental officers.

The "population" for a tender would include personnel on board tended vessels as well.

The "population" for a dispensary or infirmary would be the sum of the onboard military and civilian personnel plus authorized dependents.

The only requisite is that the same elements of "population" used in establishing the usage rate be used in estimating the requirements for future work load. The usage rate established shall be on the basis of the most recent *12 months* experience and shall be based on issues made to use only. The formula for calculating monthly usage rates is:

Hospitals and Hospital Ships:

$$\frac{\text{Total issues to use during past 12 months}}{12} \times \frac{100}{\text{Average daily patient load during past year}}$$

Other Ships and Shore Stations:

$$\frac{\text{Total issues to use during past 12 months}}{12} \times \frac{1000}{\text{Average daily population for past 12 months}}$$

Dental Department or Activities:

$$\frac{\text{Total issues to use during past 12 months}}{12} \times \frac{1}{\text{Average number of dental officers during past year}}$$

b. *Replacement Schedule.* The replacement schedule concept of reporting requirements for items which are not consumed in use and generally require replacement after one or more years in use has been cancelled. In lieu thereof

the Bureau promulgates, from time to time, lists of "Bureau-controlled items" which, due to their highly technical characteristics and specialized use, require coordinated technical management that can best be obtained at Bureau level.

c. *Safety Level*: The record for each item shall show an entry labelled "Safety Level" which shall be that quantity authorized and required to be maintained on hand.

d. *Emergency Order Point*: The record for each item shall show an entry labelled "Emergency Order Point" which shall be established as that quantity below which the on hand quantity shall not be permitted to fall without immediate action to either expedite delivery of material due in or placement of a priority order for supply.

e. *Requisitioning Objective*: The record for each item of a consumable nature shall show an entry labelled "Requisitioning Objective." The quantity indicated as the requisitioning objective shall not be exceeded by the sum of the quantities on hand and/or on order. The quantity established as the requisitioning objective for usage items shall be computed in accordance with BuMed Instructions, 4000 series.

3. Each activity must review its stock position for each item during each requisitioning cycle. Large activities may spread this review and submit requisitions as the review of each class or group of classes is completed. In any case, there must be no delay between the review of an item and the submission of a requisition for the item if the total on hand and on order is less than the requisitioning objective. The essentiality of this complete review and timely submission of resultant requisitions is emphasized during periods of reduced authorized levels of supply. Repeated emergency orders resultant to reaching the emergency order point, except in the case of emergency or insurance type items must be regarded as evidence of supply discipline failure. It is usually traceable to:

- a. Careless stock review and/or
- b. Improper computation of the requisitioning objective which may be too low.

Such situations should be corrected immediately.

Repeated absence of average items from routine replenishment requisitions indicates that reviewing personnel are waiting for the emergency order point to be reached; this is inexcusable. When the on-hand and on-order quantities continue to equal or exceed the requisitioning objective quantity without the placement of orders, the established usage rate should be checked. Unless the drop in usage is only seasonal the item should be reconsidered as to usage rate, safety levels, etc.

B. Authorized Levels of Supply; Ships:

1. The authorized levels of supply of items subject to usage are as follows:

a. *Safety Level of Supply:*

The safety level of supply shall be established as one-half the quantity listed in the current applicable commissioning allowance list or 3 months' supply for the expected strength (population) at the established usage rate plus Reserve Quantity, *whichever is greater*.

Note: The Reserve Quantity is that quantity required to initially outfit emergency stations, first-aid lockers and battle stations where normally there is no usage of material. Such initial outfitting quantities for other than the sickbay must not be regarded or recorded as issues and shall be carried on the records as still in store as Reserve Quantities. Rotation of material in these lockers, stations, etc. shall be made on an exchange basis from the storeroom.

b. *Emergency Order Point:*

The emergency order point shall be established as the quantity equal to the Safety Level of Supply plus one-half month's supply for population at current usage rates. (3½ months' supply).

c. *Requisitioning Objectives* shall be established as 1½ times the quantity listed in the current applicable Initial Outfitting List or 9 months' supply for the expected strength at the established usage rate plus the Reserve Quantity, *whichever is greater*.

Formulae: (Use whichever gives the greater quantity.)

Either $9 \text{ (months)} \times \text{established usage rate} \times \left(\frac{\text{patients}}{100}\right)$
or $\left(\frac{\text{population}}{1000}\right)$ or $\left(\frac{\text{dental officers}}{1}\right)$ plus reserve quantity
or $1\frac{1}{2} \times \text{quantity on Initial Outfitting List}$.

2. *Requisitioning Cycle:*

The requisitioning cycle for normal replenishment shall be the same duration as that allowed for Operating Levels of Supply expressed in months. *For Ships—every three months.*

IX. Reports and Forms:

Shore stations shall prepare and submit the statement of Receipts and Expenditures of Medical Department Property quarterly and upon decommissioning. Ships are not required to submit this statement of receipts and expenditures to the Bureau. However, in order to verify the value of materials remaining on hand as shown on the master control sheets of the ledgers, NavMed-E should be prepared in rough to verify such balances, and should be retained in the files of the ship. For full details of accounting procedures and submission of reports and forms, reference should be made to the *Manual of the Medical Department*, BuMed Instructions, and other current directives.

There are a number of ledger forms, each used for a different purpose. Usually in these ledgers a separate sheet is maintained for each item of supplies or equipment. It is necessary that all data required be entered thereon. Refer to the *Manual of the Medical Department* and current directives for full information on the proper entries and methods of entry on these forms.

Invoices are dealers' bills from open purchase transactions. When supplies are shipped from a medical supply depot an invoice is sent with the shipment, giving the number of each item shipped, the unit cost of each item and total cost. This is issued as the supporting voucher for entry into the journal and ledgers.

Vouchers are approved forms used to support entries in the books of account. Among many are:

Public Voucher (Standard Form 1034).—Used in making payments for materials and services other than personal.

Transfer Voucher Received.—Invoices for materials and services received at no allotment charge.

Transfer Voucher Issued.—Invoices for materials and services transferred to another activity at no allotment charge. This is generally on NavSandA Form 127, and is usually referred to as a "TVI."

Inventory Adjustment Voucher.—Worksheet with voucher listing items of supplies requiring adjustments through discrepancies between ledger balances and amounts actually on hand.

Issue Voucher.—Individual NavMed-1342 authorizing issues of supplies to use.

Issue Voucher.—Individual NavMed HF-11 authorizing issue of equipment for use or for return to store.

The invoices and vouchers listed above are the more common ones used in substantiating entries in the books of account. No entry should ever be made in the journal or ledgers without a supporting voucher to substantiate that entry.

The following listed forms are currently used in Medical Department property accountability:

Report of Defective Medical and Dental Material:

A letter report (Med 4070-2) is used, when applicable, by all Navy and Marine Corps activities or units having a representative of the Medical Department on board. A representative of the Medical Department is required to prepare a letter report when medical or dental stock items listed in the catalog are suspected of being injurious, defective, deteriorated, or otherwise unfit for use because of inherent characteristics, improper manufacture, or faulty or inadequate specifications.

The report (original and four copies), as required, shall be submitted to the Field Branch, Bureau of Medicine and Surgery, Sands and Pearl Streets, Brooklyn, 1, N. Y.

Status of Allotment (NavExos 3443):

As set forth in the *Navy Comptroller Manual*, volumes II and III and Marine Corps Memorandum 50-52, the Bureau of Medicine and Surgery requires that allotment reports be submitted by each fiscal officer or officer performing the supply function for each allotment under the appropriation, Medical Care, Navy, for which he is performing the accountability function.

Transfer of Property Custody, Medical Department (NavMed-D):

The NavMed-D reflects transfer of custody of Medical Department property between Medical Department personnel on being relieved of command or duty. The NavMed-D is used by all Navy and Marine Corps activities or units having a representative of the Medical Department on board.

Statement of Receipts and Expenditures of Medical Department Property (NavMed-E):

The NavMed-E reflects transactions involving the receipt and expenditure of Medical Department property during the accounting period. The NavMed-E is used by all stations and ships other than hospitals charged with accountability for Medical Department property.

Issue Voucher (NavMed-R):

The NavMed-R is used to request and record the issuance of expendable material within an activity. The NavMed-R is used by Medical Department activities other than hospitals.

Medical Stores Ledger Sheet (NavMed-W):

The NavMed-W is a local record and control of medical stores. The NavMed-W is used by Navy and Marine Corps activities or units having a representative of the Medical Department on board.

Equipment Voucher (NavMed HF-11):

The NavMed HF-11 is used to request and record the issuance of nonexpendable material within an activity. The

NavMed HF-11 is used by naval hospitals, hospital ships, infirmaries, naval dispensaries, yards or station dispensaries, and other Medical Department activities ashore.

BuMed Material Requisition (NavMed-4):

The NavMed-4 is used to procure medical and dental material from the regular naval supply depots. The NavMed-4 is used by Navy and Marine Corps activities or units having a representative of the Medical Department aboard.

Medical Stores Order Record (NavMed-801):

The NavMed-801 is used as a control of medical supplies and equipment. The NavMed-801 is used by naval hospitals, medical centers, and certain other Medical Department activities.

Medical Stores Usage Record (NavMed-802):

The NavMed-802 is used as a control of medical supplies and equipment. The NavMed-802 is used by naval hospitals, medical centers, and certain other Medical Department activities.

Medical Stores Receipt and Expenditure Record (NavMed-803):

The NavMed-803 is used as a control of medical supplies and equipment. The NavMed-803 is used by naval hospitals, medical centers, and certain other Medical Department activities.

Medical Stores Title Insert (NavMed-804):

The NavMed-804 is used as a title insert for medical stores record file. The NavMed-804 is used by naval hospitals, medical centers, and certain other Medical Department activities.

Medical Stores Tally Card (NavMed-805):

The NavMed-805 is used as a stock tally card to expedite medical stores control. The NavMed-805 is used by naval

hospitals, medical centers, and certain other Medical Department activities.

Equipment Location Record (NavMed-806):

The NavMed-806 is used as a control for medical supplies and equipment. The NavMed-806 is used by naval hospitals, medical centers, and certain other Medical Department activities.

Survey Request, Report, and Expenditure (NavSandA 154):

The NavSandA 154 is a Bureau of Supplies and Accounts form upon which formal or informal property surveys are prepared. A formal survey board shall be made by either a commissioned officer or a board of three officers, one of whom, and as many as practicable, will be commissioned officers, appointed in either instance by the commanding officer. The NavSandA 154 is used by all Medical Department activities when surveying material.

INSTRUCTION TEST

Assignment No. 36

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. The front of the Medical Stores Ledger Sheet is divided into four sections; namely, order section, receipts section, expended section and the section.
2. Changes may be recorded in the equipment ledger only upon authority of a properly approved or document.
3. The control sheets of the equipment ledger and the supply ledger will reflect the receipt and expenditure of
4. The two types of property surveys are and
5. The property survey procedure required for bureau cognizant material having a book value of over \$100.00 will be by
6. If an item of equipment being surveyed is given an appraised value, the approved property survey is the authority to expend the
7. Normally, the final approval of property surveys will be accomplished by the

8. The book of original entry for the Medical Department for ships and shore stations, other than naval hospitals, is the Journal of ----- and ----- of Medical Department property.
9. A physical inventory of all unissued supplies, unless otherwise directed, shall be conducted -----.
10. A physical inventory of all narcotics, alcohol, alcoholic beverages, and precious and special dental metals shall be taken by a duly constituted board -----.
11. A complete inventory of all equipment shall be held at least -----.
12. Whenever the senior Medical Department representative of a ship or station is relieved of command or duty, the transfer of responsibility and accountability to his relief or other designated person shall be made by exchanging of receipts on NavMed -----, Transfer of Property Custody.
13. The issue of equipment from the storeroom for use by a department transfers the primary ----- responsibility to the person responsible for the department in which such equipment is to be used.
14. Items of equipment found to be missing during inventory shall be -----.
15. The form upon which the property survey is prepared is the NavSandA Form -----.
16. The requisitioning objective of supplies aboard naval vessels, other than hospital ships, is one and one-half the amount on the current applicable initial outfitting list or ----- months supply, whichever is greater.
17. All quantities, bulk stock, of narcotic drugs, alcohol, alcoholic beverages, and precious and special dental metals not required for immediate use shall be maintained in ----- storage under the direct custody of an officer.
18. Aboard ship, that quantity of material required to initially outfit emergency stations, first-aid lockers, and battle stations will be carried on the supply ledger as ----- quantity.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

19. In the Medical Department of the Navy property is the term applied to
 1. equipment and supplies only
 2. land, and buildings and improvements only
 3. land, buildings and improvements, equipment, supplies and services
 4. land, buildings and improvements, equipment, and supplies-----

- 20. In order to be classified as equipment an item of property must have an expected normal useful life of one year or more and have a unit cost of approximately**
1. **\$25.00 or more**
 2. **\$50.00 or more**
 3. **\$75.00 or more**
 4. **\$100.00 or more**
-
- 21. Accountability of equipment under category I, plant property, class 3, covers certain medical and dental items regardless of unit cost, and, more specifically, items having a unit cost of**
1. **\$25.00 or more**
 2. **\$50.00 or more**
 3. **\$75.00 or more**
 4. **\$100.00 or more**
-
- 22. Accountability of equipment under category II, minor property, covers certain designated items regardless of unit cost and, more specifically, items having a unit cost of approximately**
1. **\$25.00 or more**
 2. **\$35.00 or more**
 3. **\$50.00 or more**
 4. **\$75.00 or more**
-
- 23. Which of the characteristics listed below does *not* apply to supplies?**
1. They facilitate and expedite the performance of the assigned functions of the activity, but are not consumed.
 2. They are consumed or expended within a short period of time.
 3. They are converted in the process of construction.
 4. They are used for replacement of parts for fixed equipment.
-
- 24. Professional medical and dental books will be classified as**
1. plant property class 3
 2. minor equipment
 3. controlled stores
 4. supplies
-
- 25. The equipment and supply ledger shall be maintained on either the approved card type ledger or on the Medical Stores Ledger Sheet**
1. NavMed Form D
 2. NavMed Form R
 3. NavMed Form W
 4. NavMed Form X
-

- 26.** Equipment will be issued to use or returned to store by a duly approved Equipment Voucher
1. NavMed HF-9
 2. NavMed HF-11
 3. NavMed-D
 4. NavMed-R
-
- 27.** When material is transferred between Medical Department activities, the material will be transferred on the Receipt/Expenditure Invoice, NavSandA Form
1. 110
 2. 127
 3. 129
 4. 154
-
- 28.** The columns of the R&E Journal will be totaled and the Journal will be closed
1. monthly
 2. bimonthly
 3. quarterly
 4. annually
-

INSTRUCTION TEST

Assignment No. 37

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

- 1.** NavMed 4070- 2 (Report of Defective Medical and Dental Material) shall be prepared and submitted
1. monthly
 2. quarterly
 3. semiannually
 4. as required
-
- 2.** The Journal of Receipts and Expenditures shall be closed
1. monthly
 2. quarterly
 3. semiannually
 4. yearly
-
- 3.** NavMed-D shall be prepared and submitted
1. monthly
 2. quarterly
 3. annually
 4. as required
-

4. Medical and dental items listed in the Armed Services Catalog of Medical Material are requisitioned on
1. NavMed-4
 2. NavMed-R
 3. NavSandA 129
 4. NavSandA 44
-
5. Journal of Receipts and Expenditures of Medical Department Property—Equipment Section Receipts is NavMed
1. 1183
 2. 1184
 3. 1185
 4. 1186
-
6. Journal of Receipts and Expenditures of Medical Department Property—Supplies Section Receipts is NavMed
1. 1183
 2. 1184
 3. 1185
 4. 1186
-
7. Journal of Receipts and Expenditures of Medical Department Property—Equipment Section, Expenditures is NavMed
1. 1183
 2. 1184
 3. 1185
 4. 1186
-
8. Journal of Receipts and Expenditures of Medical Department Property—Supplies Section Expenditures is NavMed
1. 1183
 2. 1184
 3. 1185
 4. 1186
-
9. A formal survey of material may be made by which one of the following?
- The commanding officer
2. The officer on whose records the material being surveyed is carried
 3. The officer charged with the custody of the material being surveyed
 4. A commissioned officer appointed by the commanding officer
-
10. NavMed HF-11 is used by the Medical Department to
1. survey equipment
 2. issue equipment
 3. receive supplies
 4. issue supplies
-

MATCHING ITEMS

To the right of each phrase or symbol in list B write the number of the one most closely related item in list A.

11. Match the following report and form numbers with their appropriate titles of reports and forms.

A	B	
1. Med 4070-2	Invoice	-----
2. Med 7330-5	Equipment Voucher	-----
3. NavMed-D	Statement of Receipts and	
4. NavMed-R	Expenditures of Medical	
5. NavMed-W	Department Property	-----
6. NavMed HF-11	Medical Stores Ledger Sheet	-----
7. NavMed-4	Status of Allotment	-----
8. NavSandA 44	Transfer of Property Custody	-----
9. NavSandA 127	Report of Defective Medical and Dental Material	-----
10. NavSandA 154	BuMed Material Requisition	-----
11. NavExos 3443	Issue Voucher	-----
	Survey Request, Report, and Expenditure	-----

COMMISSARY ORGANIZATION AND SUPERVISION

I. Introduction to Food Service Division (Commissary) Administration

A. General Information on Food Service Division Administration

As a member of the Navy Medical Department you have already had some introduction to the administration of a hospital food service division—at least to the results of that administration. Meals supply impressions as well as nourishment; and each meal you have eaten in a naval hospital has imperceptibly influenced your opinion of hospital food service, as well as your physical well-being.

Perhaps you have wondered why some hospitals are “better feeders” than others. In other words, why the food service divisions of some hospitals are accomplishing their mission in a more effective manner than those of other hospitals.

Obviously, in a large group of hospitals, some, by virtue of their size, physical plant facilities, and geographical location, will have advantages or disadvantages not common to all. Some are located in more favorable labor market areas than others and some at great distances from the country's major food marketing centers. Factors such as these have some bearing on the standards of hospital food service; however, the factors of management and organization, which, correctly applied can lead to uniformly good food service, are mutual to all naval hospitals.

Mass feeding has sometimes been defined as an assembly-line type of operation, analagous to any production system

involving the conversion of raw materials into a finished product for which there exists a consumer demand. This definition is valid only to a certain extent. The procurement and stockpiling of provisions, their subsequent alteration by physical and mechanical means, and their delivery to the consumer in the form of breakfast, dinner, and supper does and must follow an organized production schedule. But true assembly-line methods are employed primarily for the mass production of a highly standardized end product. Automobiles, typewriters, television sets, and the products of the great meat packing houses are examples of assembly-line techniques. However, standardization of meals, except in terms of their nutritional value, is neither practicable nor desirable.

Perhaps mass feeding may be more adequately defined as an assembly-line operation with a soul. The soul being supplied by the management. The knowledge, ability, and leadership qualities brought to bear on the operation of the assembly-line will to a great extent determine the appearance, adequacy, and consumer acceptability of the finished product.

It is apparent that food service supervisors must daily cope with problems of production, maintenance, sanitation, personnel management, procurement, accounting, security, storage, planning, budgeting, food selection and identification, food preparation and serving, and conservation and salvage, among others.

Effective tools and techniques to meet these problems have been developed out of experience and research. Every food service supervisor must master these tools and techniques, apply them intelligently, and keep abreast of changing methods and concepts, if his department is to accomplish its mission with the minimum expenditure of money, manpower, and materials.

B. Food Service Division—Responsibilities

(1) The Food Service Division shall:

(a) Be responsible for the proper and efficient management of the food-service activities of the hospital, including the administrative and therapeutic aspects of food preparation.

(b) Exercise strict supervision over the operation and maintenance of all food-service spaces, equipment, and materials; and maintain the highest standards of sanitation throughout.

(c) Inspect or provide for the inspection of all incoming stores and all meals before serving.

(d) Exercise strict supervision over the procurement, storage, custody, and issue of food and food preparation and service for hospital messes.

(e) Prepare, submit for approval, and post menus for the hospital mess, including special diets and special messes.

(f) Conduct a physical inventory of all provisions on hand at the close of each month and submit a report of the values on hand to the finance division.

(g) Conduct the hospital food-conservation program to prevent waste in the preparation, serving, and consumption of food.

(h) Maintain administrative responsibility for all special messes authorized by the commanding officer, including the Nurse Corps officers' mess.

(1) All authorized special messes with separate messing facilities shall be issued rations or subsistence in kind from the Food Service Division. The rations issued to special messes shall be the same as the rations served in the general mess. No distinction in quantity or quality shall be made in favor of any mess which is issued subsistence in kind. The quantities issued shall be computed on the basis of the number to be served.

(2) The privileges of the messes shall be limited to members of the service attached to the hospital, occasional guests, civilian employees, and duly accredited Red Cross representatives.

(3) The charge for meals will be at the rate prescribed by the Secretary of the Navy for those not entitled to subsistence in kind.

II. Organization and Management of a Food Service Division

A. Organization

In naval hospitals, one of the major administrative problems is the feeding of the patients and staff. Food that is well prepared and properly served is not only a major factor in the promotion of good morale, but is one of the many factors to be considered in the treatment of the patient.

Funds allotted for rations in naval hospitals are at all times adequate to maintain a standard of highest quality. It is the responsibility of the food service officer to serve meals that consist of a well-balanced ration properly prepared, pleasing to the senses, and sufficient in quantity to satisfy the appetite.

The general supervision of the Food Service Division devolves upon the food service officer who is usually a member of the Medical Service Corps or Hospital Corps. He is directly responsible to the commanding officer. The general and specific duties of the food service officer are outlined in the *Manual of the Medical Department*.

The Therapeutic (Special) Diet Kitchen is a part of the Food Service Division and is under the general supervision of the food service officer who is responsible for all equipment and personnel assigned thereto.

For greater efficiency and management, the Food Service Division may be divided into:

1. The Administrative and Stores Branch.
2. The Food Preparation and Service Branch.
3. The Therapeutic Diet Branch.
4. The Nurses' Quarters Mess.

The Administrative and Stores Branch embraces those duties relative to the proper bookkeeping, accounting, procurement, receipt, storage, and issue of all provisions and supplies; preparation of watch and detail lists, preparation of necessary reports and returns; and the administration of civilian personnel records of performance and attendance.

The Food Preparation and Service Branch is concerned with the preparation, cooking, and serving of food, meat and

bakery products; and with cleaning and care of all equipment, utensils, and spaces in the department.

The Therapeutic Diet Branch, under a dietitian, prepares and serves the therapeutic diets.

The Nurses' Quarters Mess shall be the administrative responsibility of the Food Service Division in accordance with the *Manual of the Medical Department*.

The Administrative section is under the direct supervision of the senior hospital corpsman assigned to the Food Service Division. He is responsible to the food service officer for the following:

Supervision of the operation of the administrative section and promotion of efficiency in its management.

The proper performance of duty of all military personnel and group IVb employees.

Training of enlisted personnel in the division in all phases of their duties.

Assigning details to adequately cover all sections at all times.

Submission of watch lists and liberty lists.

Daily inspection of all equipment, fittings, and cooking utensils for cleanliness and operating efficiency.

The work of the group IVb employees, and to see that it is accomplished in an acceptable manner.

Assistance to the food service officer in the preparation of estimates for ordering provisions and supplies.

The receipt of supplies and provisions, including verification of the weights and amounts received.

Performance of such other duties as the food service officer assigns.

The duties of the hospital corpsmen in the Food Service Division vary with the size, the location, physical plant facilities, and the organization of the hospital. They may be assigned duty in the offices, storerooms, or refrigerators; or as master at arms of mess halls. They may be required to operate cash registers for sale of meals, and to check those entering the mess halls who may be on commuted rations.

Upon being assigned duty in the Food Service Division, the hospital corpsman should report to the senior chief for

instructions pertaining to his detail. Regardless of what this detail may be, the first requisite is cleanliness. The nails should be kept short and clean and the hands should be well washed, especially after visiting the toilet.

A hospital corpsman detailed to storerooms should permit nothing to leave the storerooms for which he is responsible without an approved voucher. Stores being received should be properly checked in and entered in the books. Strict accounting is extremely important. Case goods should show date of receipt on outside of case, and the oldest supplies should be used first.

All material in storerooms should be stored on platforms raised off the floor. Sufficient room should be left to pass between cases and walls. This not only facilitates cleaning, but also aids in taking inventory and in preservation of material.

The principal working force of the Food Service Division consists of civilians; usually the supervisor is a Chief Quartermaster or Quartermaster Commissary, who is responsible to the food service officer. In addition, there are cooks, bakers, meat cutters, and mess attendants. These all perform duties in accordance with local organizational plans and orders.

Civilians work 8 hours per day, 5 days per week. Watches must be arranged to comply with working hours, and at the same time must cover all necessary details. This is a complicated duty, for split shifts cannot be worked.

On weekends and holidays, enlisted personnel are usually required to take over all administrative work that is usually performed by civilian personnel. This is usually done by the watch on duty. Having to assume these functions makes it necessary for all hospital corpsmen in the division to have a good working knowledge of all departments.

It is one of the duties of the senior chief hospital corpsman to train all personnel in the division so that they can accomplish their work properly and efficiently in accordance with local policy and orders.

All hospital corpsmen should be familiar with instructions contained in the *Manual of the Medical Department*, the

Manual of Naval Hygiene, and current directives which pertain to the Food Service Division.

B. Authorization and Control of Hospital Messes

(a) The broad authority for the subsisting of persons at naval hospitals is contained in *U. S. Navy Regulations*, Article 1282.

(b) The Bureau of Medicine and Surgery exercises technical and management control over naval hospital messes. The preparation and service of food in general messes of the Navy, except at naval hospitals, is under the technical control of the Bureau of Supplies and Accounts. (NR 0431, 0432, 0451.)

(c) Naval hospital messes operate under a *monetary ration allowance* prescribed by the Secretary of the Navy. This allowance is based upon prevailing average raw-food costs and is revised from time to time, as circumstances require. Usually the daily hospital ration allowance varies between \$1.10 and \$1.30. (*BuSandA Man.* 41131.)

(d) Operation of hospital messes on a monetary allowance system is at variance to the system employed in general messes of the Navy operated by officers of the Supply Corps. These prepare and issue rations in kind, in accordance with the Act of March 2, 1933 (47 Stat. 1423) as amended (34 U. S. Code 902). Under this system of feeding the composition of the ration is governed by specified allowances of food known as *ration components*. The operation of hospital messes under a monetary allowance rather than the ration components system makes recognition of the problems of mass feeding which are peculiar to hospitals; namely, the need for special diets of varying nutritional composition in the treatment of the sick, and provision of supplementary nourishment between meals to hasten recovery and shorten convalescence. The raw-food costs of special diets and nourishments, together with the raw-food costs entailed in the operation of the general and special messes at a naval hospital, enter into the calculation of the hospital's average daily cost of ration. (*BuSandA Man.* 41101.)

(e) The categories of persons subsisted, and the methods

used in obtaining reimbursement for subsistence furnished, are factors which further differentiate the operation of hospital messes from the operation of general messes on ships and at other stations. A detailed analysis of persons subsisted at naval hospitals can be found in the Ration Record (NavMed-36).

The Food Service Division furnishes "subsistence in kind" to the majority of the persons subsisted at naval hospitals. To them the division has a definite responsibility to provide a full daily ration adequate to their needs, whether such needs be three well-balanced, nutritionally adequate meals a day or a special therapeutic diet prescribed by a medical officer.

Meals are also obtained from the Food Service Division by:

(1) Persons authorized to purchase meals from the hospital messes. These may exercise their option in the choice of meals they wish to purchase.

(2) Persons furnished subsistence subject to mandatory checkage of their pay accounts.

(3) Persons required to make advance deposits of money for subsistence which will be furnished them by the hospital.

The collection and reimbursement transactions resulting from these various methods of furnishing subsistence to persons at naval hospitals are not the immediate concern of the Food Service Division. However, the relationship of the various groups must always be considered, for it has a considerable bearing on the organization and management required in the operation of the Food Service Division. (*Bu-SandA Man.* 41101 and 41131.)

III. Procurement, Accountability, and Expenditure of Provisions

A. Appropriational Charges (MMD, 24-11)

All provision items for use in a naval hospital mess are procured as an appropriational charge to "Medical Care, Navy," for the current fiscal year, except items received from other Medical Department activities that absorbed the appropriational charge upon original procurement of the items. These items, although not a charge against the Food Service Division allotment, are handled in the same manner

as any other receipt and do reflect a charge against the ration cost when they are expended.

The allotment of appropriated funds for the hospital is distributed within the command for the current fiscal year. The apportionment to the Food Service Division represents the maximum amount, by quarters, that may be expended for provision items.

The Food Service Officer is charged with initiating provision procurement requests against his allotted funds. The reduction in the allotment caused by such procurement is recorded on the provision ledger control sheet.

B. Procurement of Provision Items at Naval Hospitals

(1) *Procurement of provision items at Naval Hospitals is accomplished by:*

(a) Transfer from a naval or other Federal supply Activity.

(b) Purchase under authority of contracts let by local Supply Officers against their annual Naval Stock Fund requisitions which contain Medical Department appropriation data.

(c) Requisitioning, through Navy Market Offices, items on contracts let by Quartermaster Market Centers.

(d) Purchase of designated special diet items in the open market.

(2) *Replenishment From Supply Officers (BuSandA Man. 41211)*

Replenishments for dry provisions are obtained from the nearest distributing point or direct delivery station by means of Shipment Request (SandA 220). This type of stores is classified as an issue by the Supply Officer, and is charged to the appropriation "Medical Care, Navy," by means of a Receipt/Expenditure Invoice (SandA 127). Upon receipt and verification, the invoices are signed and the specified number of copies are returned to the issuing activity.

When eligible, minor activities may obtain fresh provisions under the market center system. Otherwise, they will be requisitioned from a supply activity on a Requisition Invoice (SandA 43). Fresh provisions furnished by Supply Officers are invoiced in the same manner as dry provisions.

(3) Purchase Against Contracts Let by the Local Supply Officer Under the Authority of His Approved Annual Requisition (BuSandA Man. 41231)

Approved annual requisitions are the basis upon which monthly, quarterly, or other contracts for provisions are entered into. The annual requisition bears the following statement:

“For purchase of authorized items of provisions for general service or for special items specifically required for hospital or special diet use for the fiscal year 19—, estimated cost \$———.”

Purchase activities (Supply) place contracts for provisions which, because of their nature, can best be purchased locally. The originating activity summarizes these contracts in bulletins. These contracts are let on a monthly and/or quarterly basis, depending on the type of item. The Food Service Officer must furnish the Supply Officer with a list of items and quantities needed for inclusion in his contracts for the area.

The order for procurement by purchase under contract is placed by the Food Service Officer direct with the vendor listed in the contract bulletin, on an Order and Inspection Report (SandA 48) or Order and Inspection Blank (NavMed-HF-23).

Inspection of these items is made by the receiving activity at time of receipt, for quality, quantity, and condition. Vendor's invoices are checked against order records in the Food Service Division; certified by the Food Service Officer; and sent to the Finance Officer for forwarding to the Regional Accounts Officer for payment.

When the local contractor refuses to deliver in accordance with his contract, the facts are stated in a letter to the Supply Officer. The letter should request that the items be purchased against the dealer's contract.

Provisions that do not conform to contract specifications should be rejected. Rejections from a local dealer are handled as follows:

(a) The Officer of the Day shall inspect the provisions, and shall state whether or not they are fit for human consumption.

(b) If Federal specifications are applicable to supplies being rejected, the U. S. Department of Agriculture representative shall be notified that the provisions are present on the hospital reservation. He shall inspect and issue directions to the vendor for the ultimate disposition of the provisions in question.

(c) An official letter of rejection shall be written to the vendor who attempted to make delivery. The letter shall state contract number, item, quantity, and specific reason for rejection. A copy of this letter shall be sent to the Supply Officer who let the contract; a copy to the Officer of the Day; and if applicable, a copy to the Department of Agriculture representative.

(4) Procurement Through the Navy Market Office System (BuSandA Man. 41233)

(a) Perishable subsistence items (fresh provisions) are procured from the Navy Area Provisions Supply Office. Requisitions shall be submitted to the Navy Market Office thirty days prior to first delivery date desired, and shall cover a fifteen to thirty day period. These requisitions shall indicate the requirements in terms of pounds or commercial containers; and shall set forth the grades, types, classes, packaging, etc. that are desired.

The Navy Area Provisions Supply Office will furnish the activity with Form FHS 230 on which requisitions will be placed.

Contracts for the purchase of these provisions are executed by the Navy Area Provisions Supply Officer, and a copy of the purchase orders issued thereunder will be mailed to the receiving activity for information relative to price and delivery specifications. Each purchase order will provide for the delivery of definite quantities of specified items on a definite delivery date.

Requisitions for perishable subsistence items may also be filled by Quartermaster Market Centers by transfer of supplies from Army Storage Stocks. In these cases shipping tickets will be mailed to the receiving activity and to the Navy Market Office concerned by the accountable Army Officer, as directed.

When payment for perishable items transferred to the Navy on shipping tickets has been effected by the Provisions Supply Office, on the Voucher for Transfers Between Appropriations and/or Funds (Standard Form 1080), one memorandum copy of the voucher will be forwarded to the receiving activity. Supplies of perishable provisions procured on shipping tickets are considered a receipt by purchase and will be taken up as such.

(5) *Open Purchase for Special Diet Items (BuSandA Man. 41234)*

There are some items that are needed in emergency or infrequently. For these, the Supply Officer will let a purchase order for delivery. The Food Service Officer locates a dealer that has the items needed, and has the Finance Officer submit a local purchase requisition to the Supply Officer. The local purchase requisition shall give a description of the item, quantity needed, unit price, value, and the name of the dealer who can furnish the item.

C. Accountability and Expenditure (HHC, 1953)

(1) Accountability of Items of Provisions

To record the procurement and expenditure of provision items, books of account are maintained in the Food Service Division. These accounting records must be on a current daily basis and must reconcile with the stores account in the hospital general ledger accounts.

The procurement and accounting sections of the Food Service Division should be located together, and should be under the direct supervision of the senior chief hospital corpsman assigned to the division. This makes it mandatory for the hospital corpsman to have a knowledge of bookkeeping and accounting procedures and a thorough knowledge of the accounting methods used in the Food Service Division.

Most hospitals now use the individual card system for provisions accounting. Under this system, there is one card for each item; and each card shows the daily receipts and expenditures of that item and a running total of amount on hand.

The daily receipt and expenditure voucher is the book of

original entry and has the effect of a general journal. The data supporting the receipt entries are obtained from dealers' delivery tickets, inspection reports, purchase orders, or other receipted vouchers. Entries for the expenditures are made the day the items are expended; and are obtained from approved expenditure vouchers, transfer vouchers issued, and approved surveys of provisions. In addition to showing the receipts and expenditures, the daily receipt and expenditure voucher shows the accumulated receipts and expenditures (total monetary value only) for the current month and quarter; the total number of rations for the day, month, and quarter; and the cost of the ration for the month and quarter.

A full explanation of the procedures used in the books of account is impractical. The hospital corpsman is referred to the *Manual of the Medical Department* and the Bureau of Medicine and Surgery Instructions and Notices for generalization of procedures. The only practical method of learning these procedures is assignment for duty in the various sections of the Food Service Division.

(2) *Expenditure of Provisions*

There are only three authorized methods of expenditure of provisions: approved expenditure vouchers, for use; transfer vouchers issued, for transfer of provisions to other activities; and approved surveys of provisions.

The head of the Food Service Division should review these vouchers daily; and from time to time he should reconcile them with entries posted to the stock tally cards and records in the accounting section, to see that all accounts are kept current.

(3) *Security of Provisions*

Any discussion of the accountability and expenditure of provisions must include security of provisions; for without proper security, there can be no proper control of accountability and expenditure.

An adequate security system requires a combination of physical (locks), clerical (bookkeeping), and police methods, with as many checks and balances as possible integrated into it. However, the system must not be so cumbersome or inflexible as to place unnecessary restrictions upon the

operational efficiency of the division. For this reason, almost any workable security system requires some faith in the integrity of individuals, but such a system should also provide means of verifying the integrity of the individuals concerned. A bookkeeping system, which will sooner or later point out violations of trust placed in employees or failures of the external security measures, is the basic part of any system of verification.

Storerooms, refrigeration spaces, and issue rooms should be kept locked at all times, except when necessary to open them for receiving, issuing, or cleaning. Locks should be changed frequently; the number of keys to locks kept at an absolute minimum; and the responsibility for custody of keys definitely established. Custody of keys should be passed only to authorized reliefs, and every person responsible for the security of locked spaces should be impressed with the importance of his responsibility.

Unauthorized personnel should not be permitted to pass through, much less loiter, in food storage or preparation spaces; nor should parking of vehicles, except authorized trucks, be permitted in areas adjacent to subsistence buildings. Either practice is conducive to pilfering, toting, and bartering.

INSTRUCTION TEST

Assignment No. 38

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

- 1. All hospitals cannot be the same in regards to size, physical plant facilities, and geographical location; but two factors which are mutual to all naval hospitals in regard to furnishing uniformly good food service are ----- and organization.**
- 2. Standardization of meals, except in terms of ----- or food value, is neither practicable nor desirable.**
- 3. Effective tools and techniques to meet the many daily problems which Food Service Division personnel must cope with have been developed from past ----- and research.**

4. The Food Service Division of a naval hospital is responsible for the administrative and aspects of food preparation.
5. The Food Service Division shall exercise strict supervision over the operation and of all food-service spaces, equipment, and materials; and shall maintain the highest standards of sanitation throughout.
6. The Food Service Division shall inspect or provide for the inspection of all incoming stores and all before they are served.
7. The Food Service Division shall conduct a physical inventory of all provisions on hand at the close of each month and submit a report of the values on hand to the Division.
8. The privileges of naval hospital messes are limited to members of the service attached to the hospital, occasional guests, employees, and duly accredited representatives.
9. In naval hospitals, a major administrative problem is the feeding of both the patients and the
10. The Therapeutic Diet Branch of a Food Service Division, under the supervision of a, prepares and serves the therapeutic diets.
11. Hospital corpsmen may be assigned various duties in the Food Service Division, including duty in offices, storerooms, refrigerators, or as of the mess halls.
12. A hospital corpsman who is responsible for a food storeroom should require an approved before he permits anything to be taken from that storeroom.
13. Food stores in storerooms are placed on platforms raised from the floor, with passageways between the cases and the walls in order to facilitate cleaning, the taking of and to aid in the of the material.
14. The normal work schedule for civilians in Food Service Divisions is hours per day, days per week.
15. Arranging watches in the Food Service Division to comply with working hours and at the same time to cover all necessary details is a complicated duty because the civilian employees cannot work shifts.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

16. The Food Service Division of a naval hospital has supervision over all food service in the hospital, except that in the
1. Staff Officers' Mess
2. Nurse Officers' Mess
3. Special Diets Mess
4. Navy Exchange Mess -----
17. The administrative responsibility for the Nurse Officers' Mess rests with the
1. the Chief Nurse
2. the Food Service Division
3. the Assistant Chief Nurse
4. the board appointed by the Commanding Officer -----
18. Personnel not entitled to subsistence in kind at naval hospitals shall pay for meals at the rate prescribed by the
1. Commanding Officer
2. Food Service Officer
3. Secretary of the Navy
4. Secretary of Defense -----
19. The Food Service Officer of a naval hospital, who is usually a Medical Service or Hospital Corps Officer, is directly responsible to the
1. Bureau of Medicine and Surgery
2. Commanding Officer
3. Executive Officer
4. Finance Officer -----
20. The Administrative and Stores Branch of the Food Service Division is responsible for all aspects of food items and their handling as listed below, except
1. ordering
2. bookkeeping and accounting
3. receipt, inspection, and storage
4. cooking and serving -----
21. The Administrative and Stores Branch of the Food Service Division is under the direct supervision of the
1. head steward
2. dietitian
3. senior hospital corpsman assigned to the division
4. civilian bookkeeper -----

- 22. On weekends and holidays, Food Service Division administrative work that is usually performed by civilians is usually taken over by**
1. split-shift civilians
 2. enlisted personnel of the duty watch
 3. the Administrative Duty Officer
 4. night duty civilians -----
- 23. Technical and management control over naval hospital messes is exercised by the**
1. Bureau of Medicine and Surgery
 2. Bureau of Naval Personnel
 3. Bureau of Supplies and Accounts
 4. Navy Market Centers -----
- 24. Monetary ration allowances for naval hospitals are prescribed by the**
1. Bureau of Medicine and Surgery
 2. Bureau of Supplies and Accounts
 3. Secretary of the Navy
 4. Secretary of the Treasury -----
- 25. The prescribed monetary ration allowances for naval hospitals are based upon**
1. patient census
 2. local restaurant prices
 3. locations of the hospitals
 4. prevailing average raw-food costs -----
- 26. At naval hospitals, the raw-food costs of special diets are**
1. absorbed into the hospitals' average daily cost of rations
 2. deducted from the patients' pay
 3. paid from separate special ration allowances
 4. paid from profits from Navy Exchanges -----
- 27. Provisions received from other Medical Department activities that absorbed the appropriational charge upon original procurement are**
1. reflected as a charge against the ration cost at the time they are received
 2. reflected as a charge against the ration cost at the time they are expended
 3. never reflected as a charge against the ration cost of the receiving activity
 4. reflected as a charge against the ration cost of the transferring activity -----

28. The Food Service Division's apportionment of funds from the hospital's allotment represents the maximum amount that may be expended for provision items
 1. by weeks
 2. by months
 3. by quarters
 4. by fiscal years -----
29. The duty of initiating provision requests against the allotted funds of the Food Service Division is a charge of the
 1. Supply Officer
 2. Food Service Officer
 3. Finance Officer
 4. Dietitian -----
30. The menus for special diets are prepared and submitted by
 1. the Chief Nurse
 2. the Food Service Division
 3. the Clinical Medicine Division
 4. the Special Services Division -----

INSTRUCTION TEST

Assignment No. 39

COMPLETION ITEMS

Complete the following statements by supplying the proper word or words.

1. The principal working force of the Food Service Division consists of ----- personnel.
2. The supervisor of the civilian working force of the Food Service Division is usually a steward or chief -----.
3. All hospital corpsmen assigned to the Food Service Division should be familiar with instructions contained in the *Manual of the Medical Department*, the *U. S. Navy ----- Manual* and other current pertinent directives.
4. The broad authority for the subsisting of persons at naval hospitals is contained in U. S. Navy -----.
5. The preparation and serving of food in general messes of the Navy, except at -----, is under the technical control of the Bureau of Supplies and Accounts.
6. General messes of the Navy, operated by officers of the Supply Corps are governed by specified allowances of food known as -----.
7. Naval hospital messes operate under a ----- ration allowance.

8. With the exception of items procured from other Medical Department activities that absorbed the appropriational charge upon original procurement, all provision items for use in a naval hospital mess are procured as an appropriational charge to the appropriation ".....,"
9. Provisions furnished to naval hospitals by Supply Officers are invoiced and charged by means of a Receipt/Expenditure Invoice (SandA Form).
10. When a local contractor refuses to deliver provisions in accordance with his contract, the facts are stated in a letter to the Officer.
11. Provision items that are to be rejected from dealers' deliveries must be inspected by the Officer of the Day to determine whether or not they are fit for
12. If Federal specifications are applicable to provisions being rejected, the U. S. Department of representative shall be notified.
13. The accounting records in the Food Service Division must reconcile with the in the hospital general ledger accounts.
14. Under the individual card system for provision accounting, each card shows the daily and of the item represented.
15. In naval hospitals provision accounting systems, the daily receipt and expenditure voucher is the book of original entry and has the effect of a general
16. Provisions may be expended by only three authorized methods: approved expenditure vouchers, transfer vouchers issued, and approved of provisions.
17. The head of the Food Service Division should review all provision expenditure vouchers
18. In any provision security system, the basic part, which will sooner or later reveal violations of trust placed in employees, or failure of the external security system, is a good system.

MULTIPLE CHOICE ITEMS

In the following statements or questions place the number preceding the correct answer in the blank space provided.

19. Which of the methods listed below is *not* used to procure food provisions at a naval hospital?
1. Transfer, from a naval or other Federal supply activity
 2. Requisitioning, through Navy Market Offices, items on contracts let by Quartermaster Market Centers
 3. Purchase of designated special diet items in the open market
 4. Requisitioning from Naval Medical Supply Depots
-
20. Replenishments of dry provisions are obtained from the nearest distributing point or direct delivery station by means of
1. Receipt/Expenditure Invoice (SandA 127)
 2. Requisition and Invoice (SandA 43)
 3. Shipment Request (SandA 220)
 4. Order and Inspection Report (SandA 48)
-
21. Replenishments of fresh provisions, from a Supply Officer, are requested by means of
1. Receipt/Expenditure Invoice (SandA 127)
 2. Requisition and Invoice (SandA 43)
 3. Shipment Request (SandA 220)
 4. Stub Requisition (SandA 129)
-
22. Which *one* of the factors listed below determines what food provisions shall be procured locally by purchase on contracts let by the purchasing activities (Supply)?
1. The unit cost of the provisions
 2. The patient census
 3. The nature of the provisions
 4. The rank of the local Supply Officer
-
23. The order for procurement of provisions by purchase under contract is placed direct with the vendor listed in the contract bulletin by the
1. Supply Officer who let the contract
 2. Finance Officer of the hospital
 3. Navy Market Center
 4. Food Service Officer
-

- 24. Orders for procurement by purchase are placed on an Order and Inspection Report (SandA 48) or**
1. Receipt/Expenditure Invoice (SandA 127)
 2. Public Voucher
 3. Inspection Blank (NavMed-HF-23)
 4. Stub Requisition (SandA 129) -----
- 25. Items purchased under contracts let by the Supply Officer are inspected for quality, quantity, and condition, at time of receipt, by the**
1. Supply Officer who let contract
 2. receiving activity
 3. Public Health Service
 4. Navy Market Office -----
- 26. When a vendor attempts to make delivery of items of provisions that do not conform to contract specifications, the receiving activity shall**
1. reject the items and write an official letter to the vendor
 2. accept the provision items if the vendor will reduce the price
 3. accept the items and write an official letter to the vendor
 4. reject the items and immediately cancel the vendor's contract -----
- 27. In addition to showing the receipts and expenditures, the daily receipt and expenditure voucher shows all but which one of the items listed below?**
1. The accumulated receipts and expenditures (total monetary value only)
 2. The total number of rations for the day, month, and quarter
 3. The cost of the ration for the day, month, and quarter
 4. The total amount of money left to spend for provisions for the quarter -----
- 28. Requisitions for fresh provisions to be procured from the Quartermaster Market Center shall be submitted to the Navy Market Office thirty days prior to first delivery date desired, and shall cover a period of**
1. one to five days
 2. five to ten days
 3. fifteen to thirty days
 4. thirty to sixty days -----

29. Ordinarily, fresh provisions at naval hospitals are procured by

1. purchase from local curb markets
2. purchase from local truck farms
3. requisition from the Quartermaster Market Centers through the Navy Market Office
4. transfer from the Department of Agriculture -----

30. Local purchase requisitions for special diet items submitted to the Supply Officer shall contain a description of the items, quantities needed, the name of the dealer who can furnish the items, and

1. the name of patients requiring the items
2. the name of the Medical Officer requesting the items
3. a statement of the reason why presently stocked items are not suitable
4. unit price and value of the items -----

APPENDIX I
ANSWERS TO QUESTIONS
ASSIGNMENT NO. 1

- | | |
|--------------------------------|---------------------------------|
| 1. inspection | 16. conformation |
| 2. striated | 17. slimy; discoloration; odors |
| 3. Agriculture | 18. joints |
| 4. quality | 19. storage; transit |
| 5. color | 20. reduces |
| 6. fat; bright | 21. without |
| 7. steers; canner | 22. twelve |
| 8. prime | 23. deeper (darker) |
| 9. delivery | 24. bruises |
| 10. finish | 25. months |
| 11. frozen | 26. mutton |
| 12. fresh chilled | 27. 4 |
| 13. discolored; elastic; odors | 28. 1 |
| 14. darker | 29. 4 |
| 15. age | 30. 5; 1; 2; 3; 4 |

ASSIGNMENT NO. 2

- | | |
|--------------------------------|-----------------------------|
| 1. alive | 11. covered |
| 2. frozen | 12. perishable; immediately |
| 3. defective | 13. messing; handling |
| 4. destroyed | 14. three |
| 5. rejection | 15. 12; 36 |
| 6. eviscerated | 16. bacteria; warm; cold |
| 7. rodents | 17. 4 |
| 8. ventilated | 18. 1 |
| 9. chill | 19. 3 |
| 10. flies; roaches; mice; rats | 20. 2 |

ASSIGNMENT NO. 3

- | | |
|-----------------------------|------------------------------|
| 1. element; compound | 11. molecular; hydrogens |
| 2. chemical reaction | 12. Hg_2Cl_2 |
| 3. formulas | 13. protons; neutrons |
| 4. molar | 14. 111.16 |
| 5. electrolytes | 15. balanced |
| 6. isotopes | 16. balancing |
| 7. weight | 17. formula |
| 8. atomic; atoms; molecular | 18. pressure |
| 9. solute; liter | 19. soluble |
| 10. normality | 20. 3 |

21. 2
22. 4
23. 1

24. 3
25. 2

ASSIGNMENT NO. 4

- | | |
|---------------------------------------------------------|----------------------------------------------------|
| 1. compounds; grouped; groups; radicals | 13. element |
| 2. four | 14. two; one; four |
| 3. two | 15. $2\text{H}_2\text{O}$ |
| 4. chemical; inter-action | 16. $\text{NaCl} + \text{H}_2\text{O}$ |
| 5. combination | 17. $\text{CaCl}_2 + 2\text{H}_2\text{O}$ |
| 6. reacts; essential | 18. $\text{ZnSO}_4 + \text{H}_2$ |
| 7. soluble; insoluble; stones | 19. $\text{CaO} + \text{CO}_2$ |
| 8. conversion; energy | 20. $\text{CuS} + \text{H}_2\text{SO}_4$ |
| 9. ions; dissolved | 21. $\text{BaSO}_4 + 2\text{NaCl}$ |
| 10. water; salt or H_2O ; NaCl | 22. $\text{KCl} + \text{H}_2\text{O}$ |
| 11. equation | 23. $\text{Na}_3\text{PO}_4 + 3\text{H}_2\text{O}$ |
| 12. atoms; atoms | 24. $\text{Al}_2(\text{SO}_4)_3 + 3\text{H}_2$ |

ASSIGNMENT NO. 5

- | | |
|-------------------------------|----------------------------|
| 1. carbon; life | 11. hydrogen; carbon |
| 2. elements | 12. yl; ane |
| 3. synthetically | 13. catalyzed |
| 4. living | 14. ring-like |
| 5. carbon; compounds | 15. aromatic |
| 6. isomers | 16. C_6H_6 |
| 7. elements; linked | 17. coal tar |
| 8. structure | 18. mono-saccharides |
| 9. valence | 19. insoluble |
| 10. formula; chemical; groups | 20. hydrolysis |

ASSIGNMENT NO. 6

- | | |
|----------------------------|-------|
| 1. minimum; lethal | 10. 1 |
| 2. diseases | 11. 4 |
| 3. stain | 12. 2 |
| 4. alkali | 13. 1 |
| 5. physiological; chemical | 14. 3 |
| 6. carbonate; caustic | 15. 2 |
| 7. antacids; peptic | 16. 3 |
| 8. depressant | 17. 4 |
| 9. 3 | 18. 1 |

ASSIGNMENT NO. 7

- | | |
|---------------------------|-------------------|
| 1. acid, absorption | 11. 3 |
| 2. acids; proteins | 12. 2 |
| 3. epigastrium; vomiting | 13. 1 |
| 4. slippery | 14. 4 |
| 5. stomach tube | 15. 3 |
| 6. 8.5 | 16. 4 |
| 7. carbon dioxide | 17. 1 |
| 8. ulcerations; digestive | 18. 3 |
| 9. diarrhea | 19. 7; 6; 4; 2; 1 |
| 10. demulcent intestinal | 20. 2; 4; 3; 5; 1 |

ASSIGNMENT NO. 8

- | | |
|---------------------------|-------------------|
| 1. infant | 11. 1 |
| 2. hepatic | 12. 3 |
| 3. colon | 13. 2 |
| 4. mucilage; indigestible | 14. 4 |
| 5. ulcers; toxins | 15. 3 |
| 6. gastroenteritis | 16. 1 |
| 7. blood | 17. 3 |
| 8. venereal | 18. 4 |
| 9. irritant; colon | 19. 4; 6; 1; 5; 2 |
| 10. hydrophilic | 20. 5; 3; 1; 2 |

ASSIGNMENT NO. 9

- | | |
|--------------------------|-------|
| 1. liver | 11. 2 |
| 2. hypnotics; basal | 12. 3 |
| 3. coma | 13. 1 |
| 4. physiological | 14. 4 |
| 5. motor | 15. 3 |
| 6. sleep | 16. 2 |
| 7. acne; fetid; muscular | 17. 4 |
| 8. sodium | 18. 1 |
| 9. insomnia; hypnotic | 19. 2 |
| 10. gitolin | 20. 3 |

ASSIGNMENT NO. 10

- | | |
|------------------------|-----------------------------|
| 1. cerebral; analgesia | 5. mental |
| 2. sedative | 6. respiratory; depressants |
| 3. coma; contracted | 7. gastric |
| 4. vasodilator | 8. dosage |

9. safety; unconsciousness	15. 1
10. two	16. 3
11. 1	17. 1
12. 4	18. 3
13. 3	19. 2
14. 4	20. 3; 5; 1; 2

ASSIGNMENT NO. 11

1. morphine; cough	11. 2
2. blood; choline	12. 3
3. tachycardia; distention	13. 2
4. glaucoma	14. 1
5. constricts	15. 3
6. embolism	16. 1
7. atropine	17. 4
8. urinary; distention	18. 3
9. mydriatic	19. 2
10. migraine	20. 2; 7; 5; 1; 3; 8

ASSIGNMENT NO. 12

1. salicylates; structure	11. dilated; clonic
2. cyanosis	12. toxic; destroyed
3. acetanilid; cyanosis	13. nose; spinal
4. slowness; postoperative	14. injection
5. disagreeable; dangerous	15. 3
6. minor; rapidity	16. 4
7. respiratory; depression	17. 1
8. volatile	18. 3
9. noxious	19. 2
10. mucous	20. 5; 3; 4; 1

ASSIGNMENT NO. 13

1. blanching; sloughing	11. 1
2. disinfectant; parasitic	12. 3
3. hemolyzes; liver	13. 2
4. negative	14. 2
5. antispasmodic; uterus	15. 3
6. fungicide	16. 4
7. protoplasm	17. 2
8. suspension; anerobic	18. 4
9. silver nitrate	19. 3; 1; 4; 2
10. gastroenteritis; paralysis	20. 4; 3; 1; 5

ASSIGNMENT NO. 14

- | | |
|--------------------------------|----------------|
| 1. mercuric; protein | 11. 4 |
| 2. intestines; diarrhea; shock | 12. 2 |
| 3. inanimate | 13. 2 |
| 4. parasitic; impetigo | 14. 1 |
| 5. eyes; bladder | 15. 4 |
| 6. mercury | 16. 3 |
| 7. eyes; respiratory | 17. 2 |
| 8. inhibit; leucocytes | 18. 4 |
| 9. cyanosis; rash; acidosis | 19. 2 |
| 10. prophylaxis; bacillary | 20. 5; 4; 2; 1 |

ASSIGNMENT NO. 15

- | | |
|----------------------------|-------|
| 1. aerobic; positive | 11. 2 |
| 2. urticarial | 12. 4 |
| 3. sublethal | 13. 3 |
| 4. microorganisms; inhibit | 14. 4 |
| 5. toxic | 15. 4 |
| 6. refrigerated | 16. 3 |
| 7. diphtheria | 17. 2 |
| 8. low; bacteria | 18. 2 |
| 9. specific | 19. 4 |
| 10. tyrocidine; gramicidin | 20. 1 |

ASSIGNMENT NO. 16

- | | |
|-----------------------------------|-------------------|
| 1. vermicides; vermifuges | 12. 4 |
| 2. toxic | 13. 1 |
| 3. fat free; carbohydrate | 14. 3 |
| 4. toxicity; ascariis | 15. 1 |
| 5. protozoal | 16. 2 |
| 6. intestines; rice water | 17. 4 |
| 7. white; leukemias | 18. 3 |
| 8. shock; vasodilation | 19. 1 |
| 9. unicellular; plasmodia | 20. 3 |
| 10. ringing; difficulty; deafness | 21. 6; 3; 4; 2; 1 |
| 11. parasiticide; filariasis | |

ASSIGNMENT NO. 17

- | | |
|-----------------------------|--------------------------------|
| 1. prophylaxis | 7. turbid |
| 2. pathogenic; preservative | 8. viruses; extracts |
| 3. antibodies | 9. exempts; contagious; resist |
| 4. lowering; calcium | 10. thyroglobulin; thyroxin |
| 5. heat; formaldehyde | 11. 1 |
| 6. curative | 12. 4 |

13. 3	17. 3
14. 1	18. 4
15. 3	19. 3
16. 2	20. 6; 4; 3; 1; 2

ASSIGNMENT NO. 18

1. Addison's	11. 4
2. calcium	12. 3
3. castrates; lactation	13. 3
4. oxytocic; peristalsis	14. 4
5. cretinism; obesity; skin	15. 1
6. menopause; lactation	16. 4
7. anterior; inhibit	17. 1
8. stilbesterol	18. 3
9. neuromuscular; fatty	19. 1
10. liver; kidney	20. 6; 4; 5; 2; 1

ASSIGNMENT NO. 19

1. label; compounding	11. 1
2. medical	12. 3
3. dose; patient	13. 2
4. back	14. 1
5. English	15. 4
6. solvent; solutions	16. 1
7. exempt; refilled	17. 3
8. stationery	18. 1
9. explain; patient	19. 3
10. nasal; vaginal; external	20. 4; 5; 8; 3; 7; 1

ASSIGNMENT NO. 20

1. proper; check	11. 2
2. systematic	12. 1
3. prescription	13. 3
4. prohibited	14. 4
5. registration; narcotic	15. 3
6. sequence; A	16. 2
7. immediately; precipitate	17. 3
8. civilian; official	18. 4
9. acacia; water	19. 2; 6; 4; 3; 1
10. reaction; pressure; overflow	20. 2; 5; 1; 6; 3

ASSIGNMENT NO. 21

- | | |
|--------------------------|----------------------|
| 1. sanitation | 11. 100; 125 |
| 2. replenishment | 12. wetting |
| 3. steam coils | 13. heat; efficiency |
| 4. heat stroke | 14. circulation |
| 5. spot | 15. 3 |
| 6. efficiency | 16. 2 |
| 7. exhaust | 17. 4 |
| 8. perspiration or sweat | 18. 2 |
| 9. drinking water | 19. 3 |
| 10. results | |

ASSIGNMENT NO. 22

- | | |
|------------------------|--------------------|
| 1. time | 11. quantitative |
| 2. oxygen | 12. outside; lower |
| 3. turbulent | 13. 2 |
| 4. military | 14. 1 |
| 5. gasoline combustion | 15. 3 |
| 6. movement | 16. 1 |
| 7. space | 17. 3; 5; 4; 6; 1 |
| 8. supply | 18. 3; 4; 2; 1 |
| 9. cooling agent | 19. 5; 2; 3; 1 |
| 10. arctic; tropics | |

ASSIGNMENT NO. 23

- | | |
|----------------|-----------------------|
| 1. weather | 11. ventilation |
| 2. entrances | 12. thermometer |
| 3. watertight | 13. grains |
| 4. rest | 14. wet bulb |
| 5. salt | 15. relative humidity |
| 6. temperature | 16. saturated |
| 7. infection | 17. 4 |
| 8. hot | 18. 3 |
| 9. seven | 19. 1 |
| 10. head; foot | |

ASSIGNMENT NO. 24

- | | |
|--------------------------|------------------|
| 1. fumigation | 8. rodenticide |
| 2. baiting; trapping | 9. surveyed |
| 3. DDT | 10. airtight |
| 4. food | 11. ventilating |
| 5. Public Health Service | 12. masking tape |
| 6. Bureau of Ships | 13. diffusion |
| 7. carboxide | 14. element |

15. nozzle; rubber	23. 3
16. opened	24. 1
17. grounded	25. 2
18. medical	26. 4
19. 2	27. 2
20. 1	28. 3
21. 4	29. 3
22. 2	30. 3

ASSIGNMENT NO. 25

1. eligibility	13. Field Branch
2. category	14. cash; discharge
3. ineligible	15. personnel
4. humanitarian	16. injury
5. identification	17. disease; injury
6. refused	18. civilian humanitarian
7. contagious	19. Governor
8. standard transfer	20. 2
9. disciplinary	21. 4
10. eligible	22. 1
11. identification	23. 3
12. unit commander	24. 2

ASSIGNMENT NO. 26

1. infirmaries	11. five
2. officer; day	12. ward
3. clinical	13. Administrator
4. advance; seven	14. Authorization; Report
5. collection	15. occupational
6. classification	16. Veterans Administration
7. Consular; commanding	17. 2
8. Record; Officer; Day	18. 4
9. half	19. 1
10. remarried	20. 3

ASSIGNMENT NO. 27

1. active; organized	9. knowledge
2. assign	10. June; December
3. him	11. February; August
4. commandant; naval district	12. anonymous
5. marks	13. commandant
6. selection board	14. aviators
7. utilization; assignment	15. reporting senior
8. present	

- | | |
|------------|-------|
| 16. August | 19. 2 |
| 17. five | 20. 4 |
| 18. 2 | 21. 3 |

ASSIGNMENT NO. 28

- | | |
|-------------------------------|-------------------------|
| 1. government | 14. Malayan |
| 2. commanding | 15. fifth |
| 3. printed | 16. following |
| 4. black | 17. prior |
| 5. September | 18. entry |
| 6. custodian | 19. allotments; neutral |
| 7. present | 20. classification |
| 8. black, blue-black; correct | 21. 3 |
| 9. prohibited | 22. 2 |
| 10. previous | 23. 2 |
| 11. reserve | 24. 1 |
| 12. Naval Personnel | 25. 2 |
| 13. black; blue-black | |

ASSIGNMENT NO. 29

- | | |
|-----------------------------------------------------|----------------------|
| 1. conviction | 13. indelible pencil |
| 2. signed | 14. copy |
| 3. court | 15. 3 |
| 4. signed | 16. 4 |
| 5. active | 17. 1 |
| 6. reenlistment | 18. 3 |
| 7. June | 19. 2 |
| 8. signed | 20. 2 |
| 9. quarterly; transfer; punishment | 21. 3 |
| 10. pay record | 22. 3 |
| 11. quadruplicate | 23. 3 |
| 12. miscellaneous; clarification; receipt; transfer | 24. 4 |

ASSIGNMENT NO. 30

- | | |
|-----------------|----------------------|
| 1. outside | 12. 4 |
| 2. one | 13. 3 |
| 3. one | 14. 2 |
| 4. enlistment | 15. 4 |
| 5. average | 16. 3 |
| 6. Reserve | 17. 1 |
| 7. verification | 18. 2 |
| 8. quarterly | 19. 4 |
| 9. 4 | 20. 3 |
| 10. 2 | 21. 2; 1; 7; 4; 3; 6 |
| 11. 1 | |

ASSIGNMENT NO. 31

1. acting; permanent	13. 2
2. reenlistment	14. 3
3. honorably; wallet	15. 1
4. identification	16. 2
5. transmittal; chronological	17. 4
6. active duty; six; reenlistment	18. 1
7. unused; disbursing	19. 4
8. administrative remarks	20. 3
9. discharge certificate; abbreviated	21. 1
	22. 2
10. information	23. 1
11. 2	24. 3
12. 4	25. 5; 2; 6; 1; 4

ASSIGNMENT NO. 32

1. dispatch	14. civil
2. Public Health Service	15. commanding officer
3. American Consul	16. 2
4. name; address	17. 1
5. active	18. 3
6. properly marked	19. 2
7. geographic	20. 4
8. Vital Statistics	21. 3
9. last	22. 2
10. autopsy	23. 1
11. leave; liberty	24. 3
12. concurrent	25. 3
13. jurisdiction; letter	

ASSIGNMENT NO. 33

1. 75.00	14. Army
2. 300.00	15. two
3. Medical Care, Navy	16. 2
4. naval medical officer	17. 1
5. shoes	18. 3
6. 150	19. 4
7. telegram	20. 1
8. naval hospital	21. 3
9. escort	22. 2
10. final destination	23. 3
11. local	24. 4
12. 8	25. 1
13. Handbook; Hospital Corps	

ASSIGNMENT NO. 34

1. ends	15. budget estimate
2. 372	16. Secretary; Navy
3. call for estimates	17. 2
4. allotment	18. 3
5. "call for estimates"	19. 2
6. 12001	20. 1
7. fiscal office	21. 2
8. 12000; 13000	22. 1
9. ship type	23. 3
10. fiscal year	24. 4
11. obligations	25. 3
12. one-year appropriation	26. 4
13. multiple year	27. 2; 4; 1
14. no-year	

ASSIGNMENT NO. 35

1. individual purchase	8. 2
2. individual purchase	9. 4
3. dispatch	10. 2
4. hospital ships	11. 3
5. annual	12. 1
6. 3	13. 3
7. 1	

ASSIGNMENT NO. 36

1. balance on hand	15. 154
2. acquisition disposition	16. 9
3. money value	17. locked
4. formal; informal	18. reserve
5. formal survey	19. 4
6. survey value	20. 2
7. reviewing officer	21. 4
8. receipts; expenditures	22. 3
9. quarterly	23. 1
10. monthly	24. 2
11. annually	25. 3
12. D	26. 2
13. custodial	27. 2
14. surveyed	28. 3

ASSIGNMENT NO. 37

- | | |
|------|------------------------------------|
| 1. 4 | 7. 2 |
| 2. 2 | 8. 4 |
| 3. 4 | 9. 4 |
| 4. 1 | 10. 2 |
| 5. 1 | 11. 9; 6; 2; 5; 11; 3; 1; 7; 4; 10 |
| 6. 3 | |

ASSIGNMENT NO. 38

- | | |
|-----------------------------|-------|
| 1. management | 16. 4 |
| 2. nutritional | 17. 2 |
| 3. experience | 18. 3 |
| 4. therapeutic | 19. 2 |
| 5. maintenance | 20. 4 |
| 6. food; meals | 21. 3 |
| 7. Finance | 22. 2 |
| 8. civilian; Red Cross | 23. 1 |
| 9. staff | 24. 3 |
| 10. dietitian | 25. 4 |
| 11. Master at Arms | 26. 1 |
| 12. voucher | 27. 2 |
| 13. inventory; preservation | 28. 3 |
| 14. eight; five | 29. 2 |
| 15. split | 30. 2 |

ASSIGNMENT NO. 39

- | | |
|----------------------------|-----------------|
| 1. civilian | 16. surveys |
| 2. cook | 17. daily |
| 3. Hygiene | 18. bookkeeping |
| 4. Regulations | 19. 4 |
| 5. naval hospitals | 20. 3 |
| 6. ration components | 21. 2 |
| 7. monetary | 22. 3 |
| 8. Medical Care, Navy | 23. 4 |
| 9. 127 | 24. 3 |
| 10. Supply | 25. 2 |
| 11. human consumption | 26. 1 |
| 12. Agriculture | 27. 3 |
| 13. stores account | 28. 4 |
| 14. receipts; expenditures | 29. 4 |
| 15. ledger | 30. 3 |

APPENDIX II

QUALIFICATIONS FOR ADVANCEMENT IN RATING

HOSPITAL CORPSMEN (HM)

RATING CODE NO. 8000

General Service Rating

Scope

Hospital corpsmen perform numerous types of medical and clerical duties in the Hospital Corps such as nursing, first aid, ward, and operating room duties. In addition to performing the usual duties of rendering first aid to injured persons, and other medical services, many hospital corpsmen are technicians in specialized fields such as X-ray, clinical laboratory, pharmacy, environmental sanitation, and embalming. May serve independently on small ships, treating all injuries and sicknesses, exclusive of major surgery. May serve as assistants to medical officers in preventing and/or treating atomic, biological, and chemical warfare injuries and in giving preenlistment physical examinations.

Emergency Service Rating

Same as General Service Rating.

Navy Enlisted Classification Codes

For specific Navy enlisted classification codes included within this rating, see Manual of Navy Enlisted Classifications, NavPers 15105 (Revised), codes HM-8400 to HM-8499.

NOTE.—All personnel who have been designated in Medical Department technical specialties will be given examinations and marks in such specialties in accordance with current instructions contained in the Manual of the Medical Department.

Qualifications for Advancement in Rating

<i>Qualifications for Advancement in Rating</i>		<i>Appli- cable Rates</i>
		HM
100	PRACTICAL FACTORS	
101	OPERATIONAL	
	1. Apply various types of bandages, splints, and dress- ings.....	3
	2. Give artificial respiration by using back-pressure arm-lift method.....	3

Ch. No. 2

<i>Qualifications for Advancement in Rating</i>		<i>Appli- cable Rates</i>
		HM
101	OPERATIONAL—Continued	
	3. Administer first-aid treatment to the injured and sick.....	3
	4. Transport wounded without litter by approved hand or back carry methods.....	3
	5. Administer medicine by mouth, by inunction, by inhalation, by rectum, intramuscularly, and subcutaneously.....	3
	6. Keep medical and surgical wards and medical department equipment and storage spaces in clean and sanitary condition.....	3
	7. Sterilize and prepare complete tray for minor surgical operation.....	2
	8. Suture minor wound; catheterize; treat abscess.....	2
	9. Typewrite for 5 minutes at 20 words a minute. (NOTE.—Touch typing is not required for HM rating. See Aerographer's Mates Qualifications 400 Performance Test Instructions.).....	2
	10. Prepare simple pharmaceutical preparations such as ointments, mixtures, solutions, and powders.....	2
	11. Perform elementary laboratory procedures such as urinalyses and blood counts.....	2
	12. Prepare and serve nonspecific special diets for patients.....	2
	13. Prepare compound pharmaceutical preparations such as elixirs, tinctures, and emulsions.....	1
	14. Prepare and serve specific diets for patients.....	1
	15. Use Navy portable resuscitator.....	1
	16. Demonstrate ability to perform independent duty satisfactorily on small ship in absence of a medical officer.....	1
102	MAINTENANCE AND/OR REPAIR (No minimum qualifications.)	
103	ADMINISTRATIVE AND/OR CLERICAL	
	1. Supervise cleaning and sterilization of ward mess gear.....	3
	2. Supervise lower-rated men in performance of clinic or ward duties.....	2
	3. Prepare official correspondence.....	2
	4. Collect data for and prepare routine official reports such as Morbidity Report and Morning Report of Sick.....	1

<i>Qualifications for Advancement in Rating</i>		<i>Appli- cable Rates</i>
		HM
103	ADMINISTRATIVE AND/OR CLERICAL—Continued	
	5. Prepare and deliver lectures on venereal disease preventive measures and first aid.....	1
	6. Inspect all types of fresh and staple foodstuffs to determine fitness for human consumption.....	1
	7. Supervise a medical department storeroom or office section.....	1
	8. Supervise procurement of provisions and preparation and serving of regular and special diets.....	1
	9. Assemble statistical data and prepare complicated official reports such as the Annual Preventive Medicine Report; make entries in the Journal of Receipts and Expenditures.....	C
	10. Give instruction to individuals and groups in the various subjects and duties required of hospital corpsmen.....	C
	11. Supervise the medical records office of a ship or station, excluding naval hospitals.....	C
200	EXAMINATION SUBJECTS	
201	OPERATIONAL	
	1. Cell and tissue structure.....	3
	2. Osteology: nomenclature, location, and function of bones.....	3
	3. Myology: nomenclature, location, and function of major muscles.....	3
	4. Elementary description and function of the following:	
	a. Circulatory system.....	3
	b. Respiratory system.....	3
	c. Digestive system.....	3
	d. Genito-urinary system.....	3
	e. Glandular system.....	3
	f. Nervous system.....	3
	g. Special sense organs.....	3
	5. Definitions and rules for first aid to the injured.....	3
	6. Symptomatology and diagnoses, first aid, and minor surgical treatment of shock; of burns, hemorrhage, sprains, dislocations, wounds, fractures, asphyxia, unconsciousness, heat exhaustion and sunstroke: of freezing, abscesses, bites, and inflammation; and of acute thoracic, abdominal, genito-urinary, and dental conditions.....	3

<i>Qualifications for Advancement in Rating</i>		<i>Appli- cable Rates</i>
		HM
201	OPERATIONAL—Continued	
	7. Types and uses of bandages; dressings for battle wounds.....	3
	8. Types and uses of splints, splinting, and other immobilization measures for first-aid care of fractures and dislocations.....	3
	9. First aid governing removal of foreign bodies from eyes, ears, nose, and throat, and superficial tissues.....	3
	10. Types of first-aid supplies and equipment.....	3
	11. Radiological safety: self-help, care of injured personnel, and decontamination of personnel.....	3
	12. Principles of nursing.....	3
	13. Clinical recording and collection of specimens.....	3
	14. General ward nursing procedures, methods, and care of patients, including surgical and contagious disease nursing.....	3
	15. Operating room and surgical techniques.....	3
	16. Methods and materials used in disinfection.....	3
	17. Methods and materials used in keeping medical department spaces in clean and sanitary condition.....	3
	18. Young's rule for calculating dosage.....	3
	19. Classification, description, action, and therapeutic uses of drugs and medicinal preparations, including administration of medicines.....	3
	20. Toxicology: classification, description, symptomatology, antidotes, and emergency treatment of poisoning.....	3
	21. Relation of personal hygiene and proper clothing in the preservation of good health.....	3
	22. Contagious and communicable diseases: sources of infection, modes of transmission, and methods for control.....	3
	23. Types and methods of immunization.....	3
	24. Water: source, purification, and storage in the field.....	3
	25. Soil: its relation to health and disease through food contamination.....	3
	26. Sewage, refuse, and excreta disposal in the field.....	3
	27. Recognition and counteraction of chemical warfare agents.....	3
	28. Diets:	
	a. Classifications, sources, values, human requirements, composition, use, and digestibility of foods.....	3

Qualifications for Advancement in Rating		Appli- cable Rates
		HM
201	OPERATIONAL—Continued	
28.	Diets—Continued	
	b. Classification of diets, diet therapy, special methods of feeding, preparation of trays, and feeding of bed patients.....	3
29.	Biological warfare and functional understanding of isolation techniques and the control of epidemics....	3
30.	Rodent and pest control methods and procedures....	3
31.	Specialized technical subjects, as appropriate. (See note on page 10-1 following Navy Enlisted Classifications and Codes.).....	3
32.	Systems of weights and measures: metric, avoirdupois, apothecary, and troy.....	2
33.	Pharmaceutical arithmetic, processes, preparations, incompatibility, and general dispensing.....	2
34.	Chemistry:	
	a. Properties and classification of matter.....	2
	b. Symbols and classification of elements.....	2
	c. Compounds differentiated from elements.....	2
	d. Atomic structure: protons, electrons, and neutrons.....	2
35.	Instruments and appliances for minor surgery.....	2
36.	Anesthetic agents, techniques of administering, and safeguards in producing anesthesia.....	2
37.	Methods of inspection and storage of food.....	1
38.	Chemical formulas, valences, atomic and molecular weights, reactions, and equations.....	1
39.	Advanced therapeutics and toxicology.....	1
40.	Prescription writing and filling.....	1
41.	Ventilation, heating, lighting, and berthing as applicable to health standards.....	1
42.	Fumigation methods and procedures.....	1
202	MAINTENANCE AND/OR REPAIR (No minimum qualifications.)	
203	ADMINISTRATIVE AND/OR CLERICAL	
	1. Methods of supervision that are necessary for efficient management of a general medical or surgical ward.....	3
	2. Standard medical department organization on ship or shore station.....	3
	3. Standard organization of a naval hospital.....	2

<i>Qualifications for Advancement in Rating</i>		<i>Appli- cable Rates</i>
		HM
203	ADMINISTRATIVE AND/OR CLERICAL—Continued	
	4. Health Record entry procedure.....	2
	5. Medical department blank forms and their identi- fication and preparation.....	2
	6. Preparation, routing, and classification of correspond- ence.....	2
	7. Preparation of official forms other than those of medical department.....	2
	8. Navy standard filing methods.....	2
	9. Personnel records and accounting; preparation of patient admission records; service records; messages and reenlistment procedure and records; reports, correspondence, and messages concerned with care of the dead.....	1
	10. Medical department supplies, property accounting, budgets, and other financial procedures.....	1
	11. Commissary organization and supervision: procure- ment, accountability, and expenditure of provisions.....	1
	12. Medical Department administration: interpretation and application of the instructions contained in the Manual of the Medical Department, Bureau of Medicine and Surgery Instructions and Notices, and applicable sections of Bureau of Naval Personnel Manual.....	C

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